Rhode Island. Dept. of Health,
Annual report

SEVENTH ANNUAL REPORT

OF THE

STATE BOARD OF HEALTH,

OF THE

STATE OF RHODE ISLAND,

FOR THE YEAR ENDING DECEMBER 31, 1884,

AND INCLUDING THE REPORT UPON

BIRTHS, MARRIAGES AND DEATHS IN 1883.

PROVIDENCE:
E. L. FREEMAN & CO., PRINTERS TO THE STATE.
1885.

MEMBERS

OF THE

RHODE ISLAND STATE BOARD OF HEALTH.

DECEMBER 31, 1884.

HENRY E. TURNER, M. D., *Chairman*	NEWPORT COUNTY.
DAVID SMITH	WASHINGTON COUNTY.
ALBERT G. SPRAGUE, M. D	KENT COUNTY.
GEORGE W. JENCKES, M. D.	PROVIDENCE COUNTY.
THOMAS H. SHIPMAN, M. D	BRISTOL COUNTY.
SAMUEL M. GRAY, C. E	PROVIDENCE COUNTY.
CHARLES H. FISHER, M. D., *ex-officio and Secretary*	PROVIDENCE COUNTY.

To the Honorable the General Assembly of the State of Rhode Island:

Herewith is respectfully presented the Seventh Annual Report of the State Board of Health, in compliance with sec. 9, chapter 83, of the Public Statutes.

The Report is for the year ending December 31st, 1884, and presents in part the general proceedings of the Board and the work performed under its supervision; and is wholly included in the report of the Secretary, which will be found in the following pages, and is respectfully submitted.

HENRY E. TURNER, *Chairman.*

CHAS. H. FISHER, *Secretary.*

April 3rd, 1885.

GENERAL CONTENTS.

REPORT OF THE SECRETARY.

Gentlemen of the Board:

It is not necessary that there should be given at this time an account in detail of the various proceedings of the Secretary, in the performance of his duties in the different departments of labor over which you have supervision.

Such an account would be a repetition only of the more lengthy reports made at the different meetings of the Board.

There will be, however, in the body of the report presented for publication the completed results of labor in connection with the vital statistics of the State for the year 1883, the circulars prepared and sent at different times to physicians, to town councils and town clerks, to local health officers and the health authorities of the State, and also to the general public, in regard to matters which have relation to vital statistics, to public and private sanitary improvements in the towns, and all measures contemplating the protection of public health.

The report upon the registration of births, marriages and deaths in 1883, will show that the returns were more complete than in previous years, by the greater fullness of the facts connected with each event, and especially by the greatly lessened number of returns of deaths with the cause stated as unknown. In the returns for 1882, the number returned with cause of death unknown was 253; in the returns for 1883, the number was 186. The result in 1883 was brought about entirely by greater care on the part of undertakers.

The tabulated summaries of monthly reports of most prevalent acute diseases prevailing in the towns of the State during 1884, have not been included in the present report, as heretofore, partly because the reports have shown that epidemics have prevailed in but very few towns, and that whenever they occurred they were, in nearly all instances, of a mild form; and partly because the annual reports of physicians covered all the essential facts relating to the prevalence of the most important diseases.

Accounts of labor in the department of contagious and infectious diseases of domestic animals, which have been made at greater length and detail in the quarterly reports at the regular meetings, are presented in brief statements in the body of the published report. The employment of some portion of one hundred and thirty-eight days, in the examination or investigation of cases or suspected cases of such diseases in useful domesticated animals, very largely among horses, is evidence of the attention given to that department of labor.

The reports from towns in relation to sanitary improvements and other measures for the promotion of public health, and the meteorological tables, are substantially the same in general plan as those presented in the preceding report of the Board.

A very considerable amount of space is given the reprint of extracts from the voluminous report of Samuel M. Gray, City Engineer of Providence, and a member of this Board, to the city council of said city, on a proposed plan for a sewerage system and for the disposal of the sewage of the city, and on other sewerage systems and methods of disposal of sewage in other cities and countries.

The increasing importance of a knowledge of the best means of removal of sewage and waste water, in the rapidly growing towns of the State provided with river or lake water for general use, and of practical and efficient methods of disposal of excreta and manufacturers' and house refuse, in towns supplied only with well water for drinking purposes, will not be questioned.

In the reprinted part of Engineer Gray's report will be found concise and clear descriptions of various methods adopted in various

localities, some of which will be applicable to localities in Rhode Island.

The concluding article, upon Disinfection and Disinfectants, will present the latest opinions of competent investigators in regard to the efficiency of the different chemical compounds used for disinfection, and the best known methods of use for the different purposes desired.

All of which is respectfully submitted.

CHAS. H. FISHER, *Secretary.*

April 2, 1885.

MEDICAL CORRESPONDENTS, R. I.

1884.

Dr. M. P. Arnold,
" H. Arnold,
" D. H. Batchelder,
" C. H. Barnard.
" W. J. Burge,
" A. B. Briggs,
" E. G. Carpenter,
" G. L. Church,
" I. B. Cowen,
" E. P. Clark,
" H. C. Crandall,
" J. H. Eldridge,

Dr. R. P. Eddy,
" D. M. Edwards,
" G. R. Fisher,
" F. B. Fuller,
" L. F. C. Garvin,
" C. H. Hadley,
" G. B. Haines,
" G. A. Harris,
" G. W. Jenckes,
" D. O. King,
" M. J. E. Legris,
" A. A. Mann,

Dr. W. C. Monroe,
" A. H. Nickerson,
" A. Potter,
" F. A. Rankin,
" F. T. Rogers,
" T. H. Shipman,
" A. G. Sprague,
" F. B. Smith,
" W. J. Smith,
" E. P. Stimson,
" H. E. Turner,
" John Winsor.

REPORT UPON THE REGISTRATION

OF

BIRTHS, MARRIAGES AND DEATHS,

IN THE

STATE OF RHODE ISLAND,

FOR THE

YEAR ENDING DECEMBER 31, 1883,

ALSO

COMMENTS UPON AND COMPARISONS OF THE SAME EVENTS FOR VARIOUS PERIODS FROM 1852 TO 1884.

By CHARLES H. FISHER, M. D.,

STATE REGISTRAR OF VITAL STATISTICS.

TABLE 1.

GENERAL ABSTRACT OF BIRTHS, MARRIAGES AND DEATHS,

IN THE STATE OF RHODE ISLAND DURING THE YEAR

1883.

TOWNS AND DIVISIONS OF THE STATE.	Population, 1880.	BIRTHS, 1883. Whole Number.	BIRTHS, Sex. Males.	BIRTHS, Sex. Females.	BIRTHS, Parentage. American.	BIRTHS, Parentage. Foreign.	BIRTHS, Parentage. Am. Father. For. Mother.	BIRTHS, Parentage. For. Father. Am. Mother.	MARRIAGES, 1883. Whole Number.	MARRIAGES, Nativity. American.	MARRIAGES, Nativity. Foreign.	MARRIAGES, Nativity. Am. Male. For. Female.	MARRIAGES, Nativity. For. Male. Am. Female.	DEATHS, 1883. Whole Number.	DEATHS, Sex. Males.	DEATHS, Sex. Females.	DEATHS, Parentage. American.	DEATHS, Parentage. Foreign.	DEATHS, Ages Given. Males.	DEATHS, Ages Given. Females.	DEATHS, Aggregate Age in yrs. Males.	DEATHS, Aggregate Age in yrs. Females.	DEATHS, Average Age in years. Males.	DEATHS, Average Age in years. Females.	Aggregate Age in years of all.	Average Age in years of all.
Barrington	1,359	21	10	11	13	5	1	2	10	10	....	....	....	14	5	9	11	3	5	9	333	462	66.60	51.33	795	56.72
Bristol	6,028	155	77	78	72	56	14	13	40	23	10	5	2	116	53	63	76	40	52	63	1,679	2,917	31.67	46.30	4,596	39.62
Warren	4,007	82	38	44	37	33	8	4	45	20	19	6	....	72	37	35	31	41	37	35	1,187	1,350	32.08	38.57	2,537	35.23
Bristol County	11,394	258	125	133	122	94	23	19	95	53	29	11	2	202	95	107	118	84	94	107	3,199	4,729	33.67	44.19	7,928	39.24
Coventry	4,519	97	46	51	53	31	8	5	23	19	1	1	2	81	38	43	71	10	38	43	1,736	2,110	45.68	49.06	3,846	47.48
East Greenwich	2,887	66	43	23	32	27	4	3	38	21	13	3	1	57	32	25	42	15	32	25	1,413	1,022	44.15	40.88	2,435	42.71
West Greenwich	1,018	22	15	7	18	1	3	....	5	5	....	....	....	11	8	3	9	2	8	3	448	94	56 00	31.33	542	49.27
Warwick	12,164	321	146	175	104	183	19	15	107	60	32	7	8	153	93	60	114	39	91	59	3,132	2,538	33.67	42.30	5,670	37.05
Kent County	20,588	506	250	256	207	242	34	23	173	105	46	11	11	302	171	131	236	66	169	130	6,729	5,764	39.35	44.00	12,493	41.36
Jamestown	459	5	2	3	5	....	...	....	2	2	....	....	....	4	4	....	4	....	4	....	188	....	47.00	....	188	47.00
Little Compton	1,202	11	6	5	9	1	1	....	8	6	....	2	...	23	12	11	23	....	12	11	778	587	64.83	53.36	1,365	59.34
Middletown	1,139	16	9	7	15	1	....	....	7	7	....	....	....	12	4	8	12	....	4	8	192	397	48.00	49.62	589	49.08
New Shoreham	1,203	32	14	18	32	....	....	....	6	6	....	....	....	20	9	11	20	....	7	11	306	519	34.00	47.18	825	41.25
Portsmouth	1,979	29	12	17	20	5	4	...	16	14	....	...	2	27	15	12	24	3	14	12	805	499	53.66	41.58	1,304	48.29
Tiverton	2,505	43	21	22	27	13	2	1	21	14	....	1	6	33	15	18	24	9	15	18	676	617	45.06	34.27	1,293	39.09
Towns, Newport Co.	8,487	136	64	72	108	20	7	1	60	49	...	3	8	119	59	60	107	12	56	60	2,945	2,619	49.91	43.65	5,564	46.75
Newport City	15,693	587	292	295	230	244	63	50	131	66	40	11	14	311	158	153	171	140	157	150	5,411	6,510	34.24	42.54	11,921	38.33

TOWNS AND DIVISIONS OF THE STATE.	Population, 1880.	BIRTHS, 1883.							MARRIAGES, 1883.					DEATHS, 1883.												
			SEX.		PARENTAGE.					NATIVITY.					SEX.		PARENTAGE.		Ages Given.		Aggregate Age in yrs.		Average Age in years.			
		Whole Number.	Males.	Females.	American.	Foreign.	Am. Father. For. Mother.	For. Father. Am. Mother.	Whole Number.	American.	Foreign.	Am. Male. For. Female.	For. Male. Am. Female.	Whole Number.	Males.	Females.	American.	Foreign.	Males.	Females.	Males.	Females.	Males.	Females.	Aggregate Age in years of all.	Average Age in years of all.
Burrillville	5,714	100	55	45	38	41	10	11	26	11	9	3	3	86	47	39	42	44	47	39	1,856	1,368	39.48	35 07	3,224	37.48
Cranston	5,940	133	72	61	70	45	8	10	22	17	1	....	4	213	110	103	92	121	106	98	4,650	4,503	42.27	43.71	9,153	42.97
Cumberland	6,445	176	87	89	51	87	17	21	71	17	42	9	3	146	67	79	56	90	66	79	1,975	2,408	29.47	30.48	4,383	30.02
East Providence	5,056	138	63	75	70	47	5	16	53	39	9	2	3	97	48	49	63	34	48	49	1,730	1,744	36.04	35 59	3.474	35.81
Foster	1,552	25	12	13	25	....	....	....	17	16	....	1	....	31	15	16	30	1	15	16	1,010	731	67.33	45.68	1,741	56.16
Gloucester	2,250	49	18	31	29	17	1	2	10	9	....	....	1	23	13	10	20	3	12	9	535	468	41.15	46.80	1,003	43.60
Johnston	5,765	119	58	61	55	47	12	5	33	27	1	4	1	47	26	21	35	12	26	21	704	1,046	27.07	49.80	1,750	37.23
Lincoln	13,765	391	191	200	76	263	17	35	115	42	52	10	11	274	138	136	95	179	138	135	3,863	3,593	27.99	26.41	7,456	27.21
North Providence	1,467	21	12	9	15	3	2	1	3	2	....	....	1	17	10	7	11	6	10	7	467	363	46.70	51.85	830	48 82
North Smithfield	3,088	50	28	22	19	25	4	2	22	12	10	...	....	37	15	22	13	24	15	22	622	757	41.46	34 40	1,379	37.27
Pawtucket	19,030	527	273	254	191	229	60	47	214	112	51	24	27	390	192	198	163	227	192	198	5,782	7,099	30.11	35.85	12,881	33 02
Scituate	3,810	79	45	34	63	10	3	3	37	35	1	1	...	71	34	37	58	13	34	37	1,477	1,749	43.44	47.27	3,226	45.43
Smithfield	3,085	54	35	19	33	17	4	....	24	11	9	2	2	27	16	11	19	8	16	11	860	716	53.75	65.09	1.576	58.37
Woonsocket	16,050	411	207	204	63	310	17	21	154	55	65	19	15	311	170	141	76	235	169	140	4,646	4,454	27.32	31.58	9,100	29.26
PROVIDENCE COUNTY.	93,017	2,273	1,156	1,117	798	1,141	160	174	801	405	250	75	71	1,770	901	869	773	997	894	861	30,177	30,999	33.49	35.67	61,176	34.56
PROVIDENCE CITY	104,857	2,916	1,474	1,442	1,195	1,138	266	317	1,177	602	332	117	120	2,357	1,145	1,212	1,059	1,298	1,145	1,212	35,281	42,938	30.81	35.42	78,219	33.18
Charlestown	1,117	14	10	4	13	....	1	...	13	12	....	....	1	12	6	6	10	2	6	6	370	241	61.66	40.16	611	50.91
Exeter	1,310	22	9	13	22	....	....	....	17	15	....	2	....	19	9	10	19	....	9	10	494	572	54.88	57.20	1,066	56.10
Hopkinton	2,952	49	25	24	42	5	....	2	34	31	2	1	....	39	14	25	38	1	14	25	810	1,300	57.85	52.00	2,110	54.10
North Kingstown	3,949	82	42	40	55	15	9	3	23	20	1	....	2	41	21	20	37	4	21	20	1,115	1,147	53.09	57.35	2,262	55.17
South Kingstown	5,114	108	51	57	93	3	7	5	35	31	3	1	...	42	19	23	38	4	19	23	1,034	1,033	54.42	44.91	2,067	49 21
Richmond	1,949	23	11	12	18	4	1	....	8	6	1	....	1	20	6	14	17	3	6	14	231	618	38.50	44.14	849	42.45
Westerly	6,104	72	39	33	41	24	4	3	44	33	5	5	1	48	23	25	29	19	23	25	580	937	25.21	37.48	1.517	31.60
WASHINGTON CO.	22,495	370	187	183	284	51	22	13	174	148	12	9	5	221	98	123	188	33	98	123	4,634	5,848	47.28	47.54	10,482	47.42
COUNTIES.																										
Bristol	11,394	258	125	133	122	94	23	19	95	53	29	11	2	202	95	107	118	84	94	107	3,199	4,729	33.67	44.19	7,928	39.24
Kent	20,588	506	250	256	207	242	34	23	173	105	46	11	11	302	171	131	236	66	169	130	6,729	5,764	39 35	44.00	12,493	41.36
Newport	24,180	723	356	367	338	264	70	51	191	115	40	14	22	430	217	213	278	152	213	210	8,356	9,129	38.50	42.85	17,485	40 66
Providence	197,874	5,189	2,630	2,559	1,993	2,279	426	491	1,978	1,007	582	192	197	4,127	2,046	2,081	1,832	2,295	2,039	2,073	65,458	73,937	31.99	35.52	139,395	33.77
Washington	22,495	370	187	183	284	51	22	13	174	148	12	9	5	221	98	123	188	33	98	123	4,634	5.848	47.28	47 54	10,482	47.42
WHOLE STATE	276,531	7,046	3,548	3,498	2,944	2,930	575	597	2,611	1,428	709	237	237	5,282	2,627	2,655	2,652	2,630	2,613	2,643	88,376	99,407	33.64	37.44	187,783	35.55

TABLE II.—BIRTHS, 1883.

Arranged by Months, Sexes and Divisions of the State.

MONTHS.	SEX.	Whole State.	DIVISIONS OF THE STATE. Bristol County.	Kent County.	Newport County, Towns.	Newport City.	Providence County, Towns.	Providence City.	Washington County.
January....	Males....	248	8	20	6	26	88	94	6
	Females..	284	8	15	9	22	105	106	19
	Total....	532	16	35	15	48	193	200	25
February...	Males....	256	11	18	7	23	83	102	12
	Females..	244	6	22	4	27	66	105	14
	Total....	500	17	40	11	50	149	207	26
March	Males....	311	15	20	3	15	98	142	18
	Females..	298	14	28	2	21	101	120	12
	Total....	609	29	48	5	36	199	262	30
April	Males....	270	7	11	7	15	88	128	14
	Females..	234	9	24	5	15	71	100	10
	Total....	504	16	35	12	30	159	228	24
May	Males....	264	8	18	4	14	82	117	21
	Females..	282	15	24	6	20	83	117	17
	Total....	546	23	42	10	34	165	234	38
June	Males....	295	12	19	5	31	86	129	13
	Females..	323	8	21	5	28	96	153	12
	Total....	618	20	40	10	59	182	282	25
July.......	Males....	317	12	26	6	30	89	135	19
	Females..	289	11	22	7	18	101	115	15
	Total....	606	23	48	13	48	190	250	34

TABLE II.—BIRTHS, 1883.—Continued.

MONTHS.	SEX.	Whole State.	DIVISIONS OF THE STATE. Bristol County.	Kent County.	Newport County, Towns.	Newport City.	Providence County, Towns.	Providence City.	Washington County.
August.....	Males....	321	16	27	6	28	107	121	16
	Females..	332	12	22	10	26	99	144	19
	Total....	653	28	49	16	54	206	265	35
September..	Males....	343	9	30	6	25	110	143	20
	Females..	291	15	18	4	20	104	112	18
	Total....	634	24	48	10	45	214	255	38
October....	Males....	324	10	20	5	32	113	123	21
	Females..	324	11	22	6	28	103	140	14
	Total....	648	21	42	11	60	216	263	35
November..	Males....	293	5	18	2	30	99	128	11
	Females..	295	11	19	9	28	86	124	18
	Total....	588	16	37	11	58	185	252	29
December..	Males....	306	12	23	7	23	113	112	16
	Females..	302	13	19	5	42	102	106	15
	Total....	608	25	42	12	65	215	218	31
Whole year.	Males....	3,548	125	250	64	292	1,156	1,474	187
	Females..	3,498	133	256	72	295	1,117	1,442	183
	Total....	7,046	258	506	136	587	2,273	2,916	370

TABLE III.—PLURALITY BIRTHS, 1883.

ARRANGED BY MONTHS AND DIVISIONS OF THE STATE, AND SHOWING THE NATIVITY OF THE PARENTS.

MONTHS.	Number of Cases.	SEX.	No. of Children.	Divisions of the State. Bristol County.	Kent County.	Newport Co., Towns.	Newport City.	Providence Co., Towns.	Providence City.	Washington Co.	Nativity of the Parents. American.	Irish.	French.	English.	Scotch.	German.	Swedish.	American Father. German Mother.	American Father. English Mother.	American Father. Irish Mother.	American Father. Swedish Mother.	Scotch Father. Irish Mother.	Scotch Father. English Mother.	Irish Father. American Mother.	Irish Father. English Mother.	Irish Father. Scotch Mother.	English Father. Scotch Mother.	French Father. American Mother.	English Father. Nova Scotia Mo.
January	4	Males 4, Females 4	8			1	1	2			1						1		1				1						
February	3	Males 3, Females 3	6		1			2			3																		
March	5	Males 2, Females 8	10					2	3			1								2				2					
April	5	Males 5, Females 5	10					2	3		1		2		1									1					
May	9	Males 8, Females 10	18		4		1	1	3		6	1	1					1											
June	10	Males 9, Females 11	20			1	2		7		3	3	1	2													1		
July	3	Males 1, Females 5	6					1	2		1													1	1				
August	7	Males 6, Females 8	14		2		1	1	3		4	1										1						1	
September	10	Males 11, Females 9	20				2	4	4		1		1	2		1	1		1		1			1					1
October	6	Males 5, Females 7	12				3	1	2		2	2	1													1			
November	2	Males 3, Females 1	4					1		1	2																		
December	5	Males 4, Females 6	10		1			1	2	1	2			1					1	1									
Whole Year	69	Males 61, Females 77	138	..	8	2	10	18	29	2	26	8	6	5	1	1	2	1	3	3	1	1	1	5	1	1	1	1	1

Table IV.—MARRIAGES, 1883.

Arranged by Months and Divisions of the State.

MONTHS.	Whole State, 1883.	DIVISIONS OF THE STATE. Bristol County.	Kent County.	Newport County, Towns.	Newport City.	Providence County, Towns.	Providence City.	Washington County.	Whole State, 1882.
January........	235	7	17	4	13	71	113	10	243
February........	153	2	6	9	13	50	65	8	197
March..........	147	5	9	3	5	48	66	11	121
First Quarter....	535	14	32	16	31	169	244	29	561
April..........	238	8	15	2	13	66	117	17	227
May............	207	9	10	6	8	56	97	21	206
June...........	250	5	14	6	8	77	127	13	221
Second Quarter..	695	22	39	14	29	199	341	51	654
July............	189	10	14	5	5	67	83	5	164
August.........	182	7	14	4	6	69	72	10	179
September......	216	6	15	2	14	64	93	22	238
Third Quarter...	587	23	43	11	25	200	248	37	581
October.........	276	11	17	7	14	68	143	16	269
November.......	311	15	13	8	21	101	133	20	349
December.......	207	10	29	4	11	64	68	21	220
Fourth Quarter..	794	36	59	19	46	233	344	57	838
Whole Year.....	2,611	95	173	60	131	801	1,177	174	2,634

TABLE V.—AGES OF PERSONS MARRIED, 1883.

AGES OF MEN.	AGES OF WOMEN.												Whole Number of Males.
	Under 20.	20 to 25.	25 to 30.	30 to 35.	35 to 40.	40 to 45.	45 to 50.	50 to 55.	55 to 60.	60 to 65.	65 to 70.	Not Stated.	
Under 20..........	47	30	....	....	...	..	..	..	..	..	..	..	77
20 to 25..........	245	588	101	10	1	1	..	..	..	..	..	..	946
25 to 30..........	94	398	278	35	18	4	2	..	..	..	..	..	829
30 to 35..........	19	98	73	66	18	5	1	..	..	..	..	..	280
35 to 40..........	10	32	42	52	32	9	6	1	..	..	..	..	184
40 to 45..........	5	6	25	21	28	21	6	1	..	..	..	..	113
45 to 50..........	....	6	6	19	18	16	5	1	..	1	..	..	72
50 to 55..........	....	3	13	3	13	8	8	6	1	..	..	..	55
55 to 60..........	....	1	2	....	2	4	8	3	2	..	..	..	22
60 to 65..........	....	....	....	....	3	2	5	1	3	1	..	..	15
65 to 70..........	....	...	1	....	2	..	2	2	2	2	1	..	12
70 to 75..........	....	....	....	....	....	..	..	2	..	1	..	..	3
75 to 80..........	....	....	....	....	....	..	..	1	..	..	1	..	2
80 to 85..........	....	....	....	....	....	..	..	..	1	..	..	..	1
Not Stated........	....	....	....	....	....	..	..	..	..	..	..	..	....
Whole No. Females.	420	1162	541	206	135	70	43	18	9	5	2	..	2611

TABLE VI.—DEATHS, 1883.

Arranged by Months, Sexes, and Divisions of the State.

MONTHS.	SEX.	Whole State.	Bristol County.	Kent County.	Newport County, Towns.	Newport City.	Providence County, Towns.	Providence City.	Washington County.
			DIVISIONS OF THE STATE.						
January....	Males....	217	6	8	5	11	72	108	7
	Females..	235	8	9	6	15	68	116	13
	Total....	452	14	17	11	26	140	224	20
February...	Males....	177	7	8	4	10	65	76	7
	Females..	175	3	12	3	13	68	71	5
	Total....	352	10	20	7	23	133	147	12
March	Males....	207	4	13	2	10	64	101	13
	Females..	235	7	13	8	12	91	92	12
	Total....	442	11	26	10	22	155	193	25
April	Males....	230	8	15	2	12	72	108	13
	Females..	245	14	13	3	9	72	123	11
	Total....	475	22	28	5	21	144	231	24
May	Males....	214	7	11	5	17	77	86	11
	Females..	231	9	6	5	9	72	119	11
	Total....	445	16	17	10	26	149	205	22
June.......	Males....	209	8	20	1	14	60	95	11
	Females..	192	8	11	4	8	58	97	6
	Total....	401	16	31	5	22	118	192	17
July	Males....	258	5	14	4	8	102	121	4
	Females..	279	6	10	7	12	105	130	9
	Total....	537	11	24	11	20	207	251	13
August.....	Males....	256	16	21	7	25	85	93	9
	Females..	243	14	13	6	18	76	107	9
	Total....	499	30	34	13	43	161	200	18
September..	Males....	222	8	15	9	18	86	83	3
	Females..	213	13	17	3	15	73	82	10
	Total....	435	21	32	12	33	159	165	13
October	Males....	227	8	19	6	11	80	95	8
	Females..	216	7	8	5	15	70	102	9
	Total....	443	15	27	11	26	150	197	17
November..	Males....	202	13	8	7	14	70	84	6
	Females..	190	13	8	6	16	54	82	11
	Total....	392	26	16	13	30	124	166	17
December ..	Males....	208	5	19	7	8	68	95	6
	Females..	201	5	11	4	11	62	91	17
	Total....	409	10	30	11	19	130	186	23
Whole Year.	Males....	2,627	95	171	59	158	901	1,145	98
	Females..	2,655	107	131	60	153	869	1,212	123
	Total....	5,282	202	302	119	311	1,770	2,357	221

TABLE VII.—DEATHS, 1883.

Showing the Number of each Sex, in each Period of Life, in every Town and Division of the State, also the Ratio of Deaths to Population, by the Census of 1880.

TOWNS AND DIVISIONS OF THE STATE.	POPULATION, 1880.		DEATHS, 1883.			Under one year.	1 and under 2.	2 and under 3.
	Whole Number.	SEX.	Per cent. to Population.	Whole Number.	SEX.			
Barrington..........	1,359	Males....	1.03	14	5	....	....	..
		Females..			9	2	....	..
Bristol..	6,028	Males....	1.92	116	53	14	3	..
		Females..			63	8	1	..
Warren.............	4,007	Males....	1.79	72	37	9	2	..
		Females..			35	7	....	..
BRISTOL COUNTY....	11,394	Males....	1.77	202	95	23	5	..
		Females..			107	17	1	..
Coventry........ ..	4,519	Males....	1.79	81	38	3	3	2
		Females..			43	4	1	2
East Greenwich......	2,887	Males....	1.97	57	32	6	4	1
		Females..			25	3	1	1
West Greenwich.....	1,018	Males....	1.08	11	8	1	....	..
		Females..			3	....	1	..
Warwick.	12,164	Males....	1.25	153	93	16	5	2
		Females..			60	10	2	..
Kent County........	20,588	Males....	1.46	302	171	26	12	5
		Females..			131	17	5	3
Jamestown..........	459	Males....	.87	4	4	....	....	..
		Females..			....	....	....	.
Little Compton......	1,202	Males....	1.91	23	12	....	....	..
		Females..			11	....	1	..
Middletown.........	1,139	Males....	1.05	12	4	1	....	..
		Females..			8	2	....	..
New Shoreham......	1,203	Males....	1.66	20	9	1	....	..
		Females..			11	3	1	..
Portsmouth.........	1,979	Males....	1.36	27	15	....	1	1
		Females..			12	3	....	..
Tiverton............	2,505	Males....	1.31	33	15	2	....	..
		Females..			18	3	1	1
TOWNS, NEWPORT CO.	8,487	Males....	1.40	119	59	4	1	1
		Females..			60	11	3	1
NEWPORT CITY.....	15,693	Males....	1.98	311	158	32	9	4
		Females..			153	22	5	3

TABLE VII.—DEATHS, 1883.—Continued.

3 and under 4.	4 and under 5.	5 and under 10.	10 and under 15.	15 and under 20.	20 and under 30.	30 and under 40.	40 and under 50.	50 and under 60.	60 and under 70.	70 and under 80.	80 and under 90.	90 and over.	Not stated.
....	....	....	1	....	....	....	....	....	....	3	....	1	....
....	....	....	....	....	...	....	1	2	....	2	2	....	....
.. .	1	1	1	....	7	3	5	4	3	6	3	1	1
....	2	....	...	3	7	6	4	6	6	11	9	....	....
....	....	4	....	1	2	2	3	5	5	3	1	....	....
....	....	2	1	3	2	2	3	3	6	4	1	1	....
....	1	5	2	1	9	5	8	9	8	12	4	2	1
....	2	2	1	6	9	8	8	11	12	17	12	1	....
....	1	1	....	1	5	1	....	2	6	7	5	1	....
...	....	1	1	1	4	3	3	4	6	3	6	4	....
....	....	....	....	....	....	1	2	2	6	7	3	....	....
....	1	1	1	...	3	2	1	1	2	5	3	....	....
....	....	....	1	....	....	...	....	....	2	2	2	....	....
....	....	....	....	....	1	....	....	...	1	....	....	....	....
....	2	8	2	5	8	1	6	9	9	12	6	....	2
....	1	3	1	2	4	6	1	4	8	6	9	2	1
....	3	9	3	6	13	3	8	13	23	28	16	1	2
....	2	5	3	3	12	11	5	9	17	14	18	6	1
....	....	....	....	....	1	....	2	....	....	1	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	....	....	....	...	1	1	2	3	3	1	1	....
....	....	....	....	....	1	1	2	1	1	3	1	....	...
....	....	....	....	....	....	....	....	1	1	1	....	....	....
....	....	....	....	...	1	....	....	....	3	....	1	1	....
....	....	....	....	1	....	....	1	1	3	....	....	....	2
....	....	....	....	....	....	....	1	....	....	4	2	....	....
....	....	....	....	....	1	....	....	1	5	4	1	....	1
....	....	1	.. .	....	1	....	2	1	...	1	3	....	....
2	....	1	....	....	....	1	1	1	1	5	1	....	....
....	....	....	....	2	3	2	....	....	2	3	....	1	....
2	....	1	....	1	2	2	5	6	13	14	3	1	3
....	....	1	....	2	6	3	5	2	6	11	7	2	....
1	2	6	3	5	14	14	13	16	10	17	10	1	1
1	....	4	3	5	9	13	14	16	11	25	17	2	3

TABLE VII.—DEATHS, 1883.—Continued.

TOWNS AND DIVISIONS OF THE STATE.	POPULATION, 1880. Whole Number.	SEX.	DEATHS, 1883. Per cent. to Population.	Whole Number.	Sex.	Under one year.	1 and under 2.	2 and under 3.
Burrillville.......	5,714	Males....	1.50	86	47	9	3	...
		Females..			39	9	3	2
Cranston*........	5,940	Males....	3.58	*213	110	9	3	1
		Females..			103	13	1	...
Cumberland......	6,445	Males....	2.26	146	67	15	5	2
		Females..			79	21	2	1
East Providence ..	5,056	Males....	1.91	97	48	6	3	...
		Females..			49	12	4	2
Foster...........	1,552	Males....	1.99	31	15	....	...	...
		Females..			16	1	1	...
Glocester	2,250	Males....	1.02	23	13	....	2	...
		Females..			10	1	...	...
Johnston.........	5,765	Males....	0.81	47	26	8	...	2
		Females..			21	2	...	1
Lincoln..........	13,765	Males....	1.99	274	138	40	13	4
		Females..			136	31	9	5
North Providence.	1,467	Males....	1.15	17	10	....	1	...
		Females..			7	....	...	...
North Smithfield .	3,088	Males....	1.19	37	15	2	...	...
		Females..			22	2	1	...
Pawtucket	19,030	Males....	2.04	390	192	40	12	7
		Females..			198	29	11	7
Scituate	3,810	Males....	1.86	71	34	4	1	1
		Females..			37	5	...	...
Smithfield	3,085	Males....	0.87	27	16	2	...	...
		Females..			11	1	...	...
Woonsocket......	16,050	Males....	1.93	311	170	46	11	2
		Females..			141	26	11	3
TOWNS, PROV. CO.	93,017	Males....	1.90	1,770	901	181	54	19
		Females..			869	153	43	21
PROVIDENCE CITY.	104,857	Males....	2.24	2,357	1,145	245	71	30
		Females..			1,212	202	60	27
Charlestown......	1,117	Males....	1.07	12	6	....	...	...
		Females..			6	....	...	...
Exeter	1,310	Males....	1.45	19	9	....	...	...
		Females..			10	....	...	..
Hopkinton.......	2,952	Males....	1.32	39	14	2	...	...
		Females..			25	3	...	...
North Kingstown.	3,949	Males....	1.03	41	21	2	...	...
		Females..			20	....	1	...
South Kingstown.	3,114	Males....	0.82	42	19	3	...	...
		Females..			23	2	...	1
Richmond.	1,949	Males....	1.02	20	6	1	...	...
		Females..			14	....	...	1
Westerly.........	6,104	Males....	0.78	48	23	8	...	1
		Females..			25	4	1	1
TOWNS, WASH. CO.	22,495	Males....	0.98	221	98	16	...	1
		Females..			123	9	2	3

* Including 105 in the State Institutions.

TABLE VII.—DEATHS, 1883.—Continued.

3 and under 4.	4 and under 5.	5 and under 10.	10 and under 15.	15 and under 20.	20 and under 30.	30 and under 40.	40 and under 50.	50 and under 60.	60 and under 70.	70 and under 80.	80 and under 90.	90 and over.	Not stated.
....	....	3	1	1	6	4	....	3	3	10	4	...	....
....	....	....	....	1	5	4	1	5	....	3	5	1	....
....	1	2	3	5	11	6	13	17	17	10	7	1	4
....	2	4	....	3	6	12	11	4	15	14	10	3	5
3	....	2	....	1	9	5	4	5	4	9	2	....	1
....	2	2	1	2	13	7	5	5	10	5	3	....	....
1	1	4	1	1	4	5	3	3	11	2	3	....	....
...	....	1	....	....	3	3	6	5	3	4	4	2	....
....	....	....	...	1	....	....	2	1	2	5	3	1	....
....	....	2	....	....	2	....	1	2	3	3	1	....	....
....	...	1	....	2	1	....	....	....	1	3	2	....	1
....	....	....	....	1	....	1	1	1	1	1	1	1	1
....	1	2	1	2	2	1	....	....	2	1	4	....	....
....	....	1	...	....	2	2	....	3	4	3	3	....	....
1	1	3	3	2	16	3	12	10	14	9	6	1	....
2	3	3	7	9	12	12	8	14	9	6	4	1	1
....	....	1	....	....	1	1	1	....	3	2	...	....	....
....	....	....	....	1	2	....	....	1	1	....	1	1	....
....	....	1	1	1	1	1	1	2	3	....	2	....	....
2	....	....	....	....	7	4	....	....	2	3	....	1	...
5	1	7	4	9	23	16	10	15	14	21	8	....	....
2	1	6	5	15	18	20	15	16	15	21	15	2	....
1	....	2	1	1	3	3	1	....	3	6	7	....	....
....	1	....	....	2	3	5	1	5	6	2	4	3	....
....	....	....	....	....	2	....	1	3	2	3	2	1	....
....	....	....	....	....	1	....	....	....	2	3	4	....	....
3	1	3	6	6	24	16	10	7	15	11	8	....	1
1	3	6	2	7	14	20	6	10	7	10	11	3	1
14	6	31	21	32	103	61	58	66	94	92	58	4	7
7	12	25	15	41	88	90	55	71	78	78	66	18	8
19	15	43	16	45	127	98	96	102	98	103	33	4	....
15	12	38	26	35	134	127	117	132	95	104	75	13	....
....	....	....	....	....	1	....	....	....	2	3	....	....	....
....	....	....	1	1	2	....	....	....	....	1	1	....	....
....	....	1	....	1	....	1	1	....	1	2	2	....	....
....	....	....	....	1	....	2	....	2	2	2	1	....	....
....	....	....	....	....	1	....	...	3	1	3	4	....	....
....	....	1	2	....	1	....	....	6	4	5	2	1	....
....	...	1	....	2	1	....	1	3	1	7	3	....	....
....	....	....	....	1	2	2	2	1	2	4	3	2	...
....	...	....	....	1	....	....	2	2	5	3	2	1	....
....	....	....	...	1	5	3	....	3	....	3	5	....	....
....	....	....	....	1	....	...	2	1	1	....	....	....	....
...	....	1	....	....	3	1	1	1	4	2	....	....	....
....	....	3	1	....	2	1	1	2	1	2	1	....	....
....	1	3	...	1	2	....	1	2	1	7	....	1	....
....	....	5	1	5	5	2	7	11	12	20	12	1	....
....	1	5	3	5	15	8	4	15	13	24	12	4	....

TABLE VII.—DEATHS, 1883.—RECAPITULATION BY COUNTIES.

COUNTIES.	Population, 1880.		Deaths, 1883.			Under one year.	1 and under 2.	2 and under 3.
	Whole Number.	SEX.	Per cent. to Population.	Whole Number.	Sex.			
Bristol Co	11,394	Males....	1.77	202	95	23	5	...
		Females..			107	17	1	...
Kent Co.........	20,588	Males....	1.46	302	171	26	12	5
		Females..			131	17	5	3
Newport Co	24,180	Males....	1.77	430	217	36	10	5
		Females..			213	33	8	4
Prov. Co	197,874	Males....	2.08	4,127	2,046	426	125	49
		Females..			2,081	355	103	48
Wash. Co........	22,495	Males....	0.98	221	98	16	...	1
		Females..			123	9	2	3
Whole State	276,531	Males....	1.91	5,282	2,627	527	152	60
		Females..			2,655	431	119	58

TABLE VII.—DEATHS, 1883.—RECAPITULATION BY COUNTIES.

3 and under 4.	4 and under 5.	5 and under 10.	10 and under 15.	15 and under 20.	20 and under 30.	30 and under 40.	40 and under 50.	50 and under 60.	60 and under 70.	70 and under 80.	80 and under 90.	90 and over.	Not stated.
....	1	5	2	1	9	5	8	9	8	12	4	2	1
....	2	2	1	6	9	8	8	11	12	17	12	1	....
...	3	9	3	6	13	3	8	13	23	28	16	1	2
....	2	5	3	3	12	11	5	9	17	14	18	6	1
3	2	7	3	6	16	16	18	22	23	31	13	2	4
1	....	5	3	7	15	16	19	18	17	36	24	4	3
33	21	74	37	77	230	159	154	168	192	195	91	8	7
22	24	63	41	76	222	217	172	203	173	182	141	31	8
...	....	5	1	5	5	2	7	11	12	20	12	1	....
....	1	5	3	5	15	8	4	15	13	24	12	4	....
36	27	100	46	95	273	185	195	223	258	286	136	14	14
23	29	80	51	97	273	260	208	256	232	273	207	46	12

TABLE VIII.—CAUSES OF DEATH, 1883.

Arranged Alphabetically; showing the Number of each Sex who died from each cause, and in each month, and in the whole year 1883; also the Number of American and of Foreign Parentage, from each cause, during the year.

CAUSES OF DEATH.	Jan.		Feb.		Mar.		April.		May.		June.		July.		Aug.		Sept.		Oct.		Nov.		Dec.		PARENTAGE.		SEX.		
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	Am.	For.	M.	F.	Total.
Accidents (various)	5		2	2	1		2		1	1	5		2	2	6	1	2		3		4		3	1	20	23	36	7	43
" Asphyxia	1		1	1	2									1	1		1	2		2					5	7	6	6	12
" Burns and Scalds	1		2	1	1	3		1	2				1	1	1		1						2	1	3	15	11	7	18
" Drowning							3		1	2	3		6		3		2		1	3	1		1	1	5	22	21	6	27
" Falls	1	1	2			1	1	1	1	1	2		2	1	1	1			2	2	1				11	10	13	8	21
" Poisoning	1	1									1		1		1			1							2	4	4	2	6
" Railroad									1		2		3		3		1		2		4				5	11	16	...	16
Abscesses					1					1	1				1	1	1		2	1		1			6	4	6	4	10
" of Brain						1				1															1	1	...	2	2
" of Leg									1																....	1	1	...	1
" Lumbar									1																1	....	1	...	1
" of Lungs									1											1					1	1	1	1	2
" Pelvic				1																					1	....	...	1	1
" of Prostate																					1				1	....	1	...	1
Abortion		1		1		1												1							3	1	...	4	4
Adenitis							1						1												....	2	2	...	2
Alcoholism	3	1			1	1	1			2		1	1	1	1	1	1	1		1	1		1	2	6	15	10	11	21
Anæmia									1	1					1					1		2			3	3	2	4	6
Anasarca																								1	1	....	...	1	1
Aneurism, Abdominal							1												1						2	....	2	...	2
" of Aorta	2																				1		1	1	3	2	4	1	5

CAUSES OF DEATH.	Jan.		Feb.		Mar.		April.		May.		June.		July.		Aug.		Sept.		Oct.		Nov.		Dec.		PARENTAGE.		SEX.		
	M.	F.	M.	F.	M.	F	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	Am.	For.	M.	F.	Total.
Aneurism, Cerebral																							1			1	1		1
Apoplexy	4	12	5	3	6	5	7	7	9	13	3	7	6	4	6	12	9	6	4	5	4	2	11	7	102	55	74	83	157
Ascites														1												1		1	1
Asthenia	1				2						1	1				1	1	1				2	1		4	7	6	5	11
Asthma		1					1	1	3	1	1						1		2		1			1	8	5	9	4	13
Atelectasis Pulmonum	1									1	1						1				1				2	3	4	1	5
Bladder, Disease of													1		1									1	3		2	1	3
" Inflammation of	3				1		1				1		1				1								2	6	8		8
Bones, Disease of														1												1		1	1
Bowels, Disease of												1			1		2						1		3	2	4	1	5
" Intussusception of															1										1		1		1
" Perforation of																						1				1		1	1
" Stricture of													1												1		1		1
" Ulceration of									2				1												2	1	3		3
Brain, Disease of	5	2	2	2			5	2		1	2		1	1	2		2		2	1	1	2	2		19	16	24	11	35
" Congestion of							1	3	2	1		1	2	1	2	2	1	2	3			1	1	1	15	9	12	12	24
" Inflammation of	3	5	1	1	5	2	4	3	5	4	6	7	6	2	7	3	4	4	4	3	3	1	1	7	42	49	49	42	91
" Softening of	1	3		1			1		1			1	2		3		1	2		1		1	1	2	15	6	10	11	21
Bronchitis		3	2	2	7	5	7	5	1	2	2	2			2		1		1	1	3	3	4	3	23	33	30	26	56
" Acute	3	1	2	2	2	1	3		1	1		1		2	1			2		1	1		4	1	16	13	17	12	29
" Chronic	1		2	1		2	1	3		3	1			1		2		1		2	2	2	2		12	14	9	17	26
Cancer (various)		2	2	5		5		3	2	3	3	6	1	4		2	2	4	1		1	5	2	2	39	16	14	41	55
" of Abdomen					1						1								1						2	1	3		3
" of Breast				1		1		5		2		3		1		2		4		2		1		2	15	6		21	21
" of Bladder															1										1		1		1
" of Bowels										1		1	1												1	2	1	2	3

TABLE VIII.—DEATHS, 1883.—Continued.

CAUSES OF DEATH.	Jan.		Feb.		Mar.		April.		May.		June.		July.		Aug.		Sept.		Oct.		Nov.		Dec.		PARENTAGE.		SEX.		
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	Am.	For.	M.	F.	Total.
Cancer of Chest																			1						1		1		1
" of Face									1		2						1								3	1	4		4
" of Liver		1			1									2	1			3		1	1	2	2	1	5	10	5	10	15
" of Neck							1																			1	1		1
" of Omentum										1				1											2			2	2
" of Ovaries										1															1			1	1
" of Pancreas																	1								1		1		1
" of Prostate																					1					1	1		1
" of Rectum			2					1							1										2	2	3	1	4
" of Spleen								1																		1		1	1
" of Stomach		1	2	1	1	1	1	1	1	2	2	1	1		1			1	2	1		2	3	1	14	12	14	12	26
" Sub-Maxillary																	1									1	1		1
" of Throat			1																							1	1		1
" of Uterus		5				3		3		2		3		4				2		2		2		1	18	9		27	27
Carbuncle			1								1					1									2	1	2	1	3
Catarrh													1					1								2	1	1	2
Cellulitis Pelvic												1		1											2			2	2
Cerebritis						1											1								2		1	1	2
Child-Birth		1		3		2		4		3		4		2		3		2		2		3		3	12	20		32	32
" Puerperal Conv.								1																	1			1	1
" " Fever		1						1		2		3		1		1		1				1			5	6		11	11
Cholera, Sporadic														2											1	1		2	2
" Infantum			1	1	2		1		2	1	6	5	44	53	34	34	18	9	4	5	2	1	2	2	94	133	116	111	227
" Morbus						2			1				6	2	2	6		2	1	1					10	13	10	13	23

CAUSES OF DEATH.	Jan.		Feb.		Mar.		April.		May.		June.		July.		Aug.		Sept.		Oct.		Nov.		Dec.		PARENTAGE.		SEX.		
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	Am.	For.	M.	F.	Total.
Cholera, Winter						1		1																	2			2	2
Chorea						1																				1		1	1
Colic				1							1		1				1									4	3	1	4
Coma																1			1						2		1	1	2
Consumption	28	29	32	28	33	34	40	38	33	46	30	32	22	29	19	35	22	29	31	30	36	39	32	39	286	480	358	408	766
Convulsions	5	5	5	4	6	7	7	4	4	3	6	4	7	6	8	1	2	7	6	7	2	2	3	1	44	68	61	51	112
" Uræmic											1														1		1		1
Cancrum Oris																			1						1		1		1
Croup	8	5	2	7	2	6	2	1	2	3	1	1	1	1	2		5	1	2	4	2	6	3	4	33	38	32	39	71
Cyanosis		1			1		1	1	1							1	3			1		1			7	4	6	5	11
Debility	5	3	3	4	3	6	4	2	8	3		1	5	6	3	10	5	4	9	3	3	4	4	6	39	65	52	52	104
" Exhaustion	1		2			2	1	2	2	3		5	2	3	2			2	3	4	3	4	5	2	27	21	21	27	48
" Premature Birth	3	1		1		2	2	1			3	1	4	5	2	2	1	5		1	3	2	1		23	17	19	21	40
Delirium Tremens	1										1		2	1	1				1		1				1	7	7	1	8
Diabetes							1	1	1	1					1	1			2	1	1			1	10	1	6	5	11
" Mellitus					1		1				1							1							1	3	3	1	4
Diarrhœa	1	3	4	2	2	2		1		2	2	2	8	16	18	15	6	5	7	3		1	3	1	52	52	51	53	104
" Chronic		1	1		2	1		1	2		2			2	6	3	1	1	1						12	12	15	9	24
Diphtheria	7	6	2	4	2	3	1		1	8	4	5		5	1	3	7	8	8	6	4	2	2	6	45	50	39	56	95
Dropsy	2	3	1	3	3	3	4	3			3	2	2	1	1	3	2	2				4	3	1	33	13	21	25	46
" of Chest																1									1			1	1
Dysentery			3							1	4	4	5	8	3	6	2	6	1	4	2	2		1	23	29	20	32	52
" Chronic								1																	1			1	1
" Typhoid										1																1		1	1
Dyspnea											1				1										2		2		2
Embolism								1		1					1						1				1	3	2	2	4

Table VIII.—DEATHS, 1883.—Continued.

Causes of Death.	Jan. M.	Jan. F.	Feb. M.	Feb. F.	Mar. M.	Mar. F.	April. M.	April. F.	May. M.	May. F.	June. M.	June. F.	July. M.	July. F.	Aug. M.	Aug. F.	Sept. M.	Sept. F.	Oct. M.	Oct. F.	Nov. M.	Nov. F.	Dec. M.	Dec. F.	Parentage. Am.	Parentage. For.	Sex. M.	Sex. F.	Total.
Emphysema																	1									1	1		1
Empyema						1																				1		1	1
Enteritis	3	4	1	2				1	1	2	4	1	1		5	1				2	1			3	11	21	16	16	32
" Gastro	3			1								1		6	2	1		1		1	1	1		1	9	10	6	13	19
" " Chronic									1											1					1	1	1	1	2
Entero Colitis															2	1			1			2			3	3	3	3	6
Epilepsy			1	1		1		2			2		2	2				1				2	3	1	6	12	8	10	18
Erysipelas			3	1	1	3	3	1	3	1			1	1	1			1	1			1		1	13	10	13	10	23
Exposure	1												1										1		1	2	3		3
" to Cold	2		1																				1		2	2	4		4
Fever				1							1					1	2		1					1	1	6	4	3	7
" Bilious									1																1		1		1
" Intermittent																			1							1	1		1
" Malarial	2												1			1		1		1					3	3	3	3	6
" " Typho														1			1		1				1		2	2	3	1	4
" Remittent																	1								1		1		1
" Typhoid	7	18	7	3	9	8	18	19	8	6	4	2	8	5	9	3	22	11	17	18	13	6	10	6	108	129	132	105	237
" Typhus																			1						1		1		1
Fits					3		1	3					1			1	1	1		1			2		9	5	8	6	14
Gall Stones														1											1			1	1
Gangrene			1		1			1	1								1	1		1					3	4	4	3	7
" of Intestine									1																1		1		1
Gastralgia																						1			1			1	1
Gastritis			1	1	1			2			1				1	1	1								3	6	5	4	9

CAUSES OF DEATH.	Jan.		Feb.		Mar.		April.		May.		June.		July.		Aug.		Sept.		Oct.		Nov.		Dec.		PARENTAGE.		SEX.		
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	Am.	For.	M.	F.	Total.
Gastritis, Acute		1									1														1	1	1	1	2
" Chronic					1			1			1			1		1				3	1	1			1	9	3	7	10
Gastro Colitis																					1				1	....	1	...	1
Heart, Disease of	9	11	12	10	14	10	17	13	11	6	9	6	11	13	10	9	12	7	9	13	12	11	11	13	154	105	137	122	259
" Dilatation of																		1	1				1		....	3	2	1	3
" Dropsy of		1			1			1																1	3	1	1	3	4
" Fatty Degeneration of			1				1	1			1	1			1			1		1					7	1	4	4	8
" Hypertrophy of		1			1							1			1						1	1			3	3	3	3	6
" Inflammation of	1	1	1		1		2	2	1	3		2	1		1						1				5	12	9	8	17
" Neuralgia of																					1				1	....	1	...	1
" Paralysis of					1			1		3				1				1	1		1		2		4	7	5	6	11
" Rheumatism of								1							1					1					3	....	1	2	3
" Valvular Disease of		1				1		1	1								1	1				2		1	8	1	2	7	9
Hæmatemesis			1																						....	1	1	...	1
Hæmaturia																							1		1	....	1	...	1
Heat														1											....	1	...	1	1
Hemiplegia		2		1	1	1				1			1	1										1	5	4	2	7	9
Hæmoptysis									1															1	2	....	1	1	2
Hemorrhage	1					1		1			1	1	1	2							1				5	4	4	5	9
" of Bowels																			1						1	....	1	...	1
" of Lungs					1		1		2			1		1			1		2						3	6	7	2	9
" from Mouth													1												....	1	1	...	1
" from Placenta														1											....	1	...	1	1
" Umbilical	1						1																		2	....	2	...	2
Hemorrhoids									1																....	1	1	...	1
Hernia	1								1							2	1	1				1			4	3	3	4	7

TABLE VIII.—DEATHS, 1883.—Continued.

CAUSES OF DEATH.	Jan.		Feb.		Mar.		April.		May.		June.		July.		Aug.		Sept.		Oct.		Nov.		Dec.		PARENTAGE.		SEX.		
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	Am.	For.	M.	F.	Total.
Hip, Disease of						1																				1		1	1
Hip-joint, Disease of	1		1												1											3	3		3
Hydrocephalus	1	1	2		1		3	1	1	3	4	2	3	6	5	3		2	1	4	1				21	23	22	22	44
Hydrothorax																					1					1	1		1
Inanition				1	1										1	2	1		2	1					4	5	5	4	9
Influenza								2		1															2	1		3	3
Innutrition																				1						1		1	1
Intussusception													1											1		2	1	1	2
Insanity	2	1	4	1		2	1	1	2	2		2	1	4	1	4	1								17	12	12	17	29
Jaundice			1	1					1		1							1							2	3	3	2	5
Kidneys, Disease of	1		3	1	2	2		1			3	1				1	1	3	5		2	1	1		17	11	18	10	28
" Brights Disease of	2	3	3	1		4	6	1	9	5	3	4	6	5	6	3		6	3	4	5	2	3	1	49	36	46	39	85
Laryngitis	1								1				1	1							1				3	2	4	1	5
Leucocythæmia															1										1		1		1
Lightning Stroke														1											1			1	1
Liver, Disease of	1	2	1	2		4				1	1	1	1				2		1	3			1		11	10	8	13	21
" Cirrhosis of		1							3	1	2		1	1	1		1		1		1	1		1	4	11	10	5	15
" Hypertrophy of											1							1								2	1	1	2
" Inflammation of			1			1	1												2	1	1				2	5	5	2	7
Locomotor Ataxia	2				1		1																		1	3	4		4
Lungs, Disease of	1	1		1			1				1	1	1	1	1	1							1		7	4	6	5	11
" Congestion of	3	1	3	1		4	1	3		1	1	2	3				1	1	2	1	1	2	1	2	21	13	16	18	34
" Gangrene of															1											1	1		1
" Œdema of		1					1	1				1													1	3	1	3	4

CAUSES OF DEATH.	Jan.		Feb.		Mar.		April.		May.		June.		July.		Aug.		Sept.		Oct.		Nov.		Dec.		PARENTAGE.		SEX.		
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	Am.	For.	M.	F.	Total.
Malaria	..	..	..	..	..	..	..	1	..	..	..	..	1	..	1	..	1	..	..	..	2	..	..	1	4	3	5	2	7
" Typhoid	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	1	....	...	1	1
Malformations	..	..	1	..	1	..	2	3	1	1	1	1	..	..	..	..	2	..	1	..	2	..	..	1	11	6	11	6	17
Malnutrition.	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	....	1	...	1
Mammitis	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	....	1	...	1
Marasmus	4	2	3	4	4	1	..	2	4	..	2	2	4	3	2	3	6	5	6	4	5	..	3	..	37	32	43	26	69
" Senile	..	1	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	....	2	...	2	2
Measles.	..	..	3	..	2	..	..	1	..	..	2	..	..	..	1	..	..	..	..	..	1	1	2	1	9	5	11	3	14
Meningitis, Spinal.	..	..	..	..	..	1	..	..	1	..	..	1	..	1	..	..	..	..	..	1	2	1	..	..	6	2	3	5	8
" Cerebro Spinal	3	..	1	3	1	..	1	1	1	1	1	3	1	..	..	1	..	2	2	..	..	3	1	..	10	16	12	14	26
" Tubercular	..	..	..	..	2	1	1	..	1	..	1	..	..	..	..	..	..	1	1	..	1	..	1	..	7	3	8	2	10
Metritis	..	..	..	..	..	..	..	1	..	2	..	1	..	..	..	..	..	..	..	..	..	..	..	..	1	3	...	4	4
" Puerperal	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1	..	..	..	..	..	1	2	1	...	3	3
Mortification	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	1	....	1	...	1
Mumps	..	..	..	..	1	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	2	....	2	...	2
Murder.	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	..	..	..	..	..	..	..	1	..	2	1	3	...	3
Nephritis.	1	1	..	..	..	..	1	1	1	..	..	..	1	..	..	..	..	..	..	1	..	..	..	1	4	4	4	4	8
Obstipation	..	..	1	..	..	1	..	..	..	1	1	..	..	1	..	..	..	1	2	..	2	..	1	..	8	3	7	4	11
Old Age.	9	25	1	14	12	23	10	19	7	13	9	6	9	15	12	14	9	8	11	12	..	6	16	15	184	91	105	170	275
Opium Habit	..	..	..	..	..	..	2	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	1	4	....	3	1	4
Ovariotomy	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	....	1	...	1	1
Paralysis	6	7	7	4	3	5	1	3	5	1	6	6	8	5	2	5	5	7	10	2	5	3	5	6	90	27	63	54	117
Parotitis	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	....	1	...	1
Peritonitis.	1	1	..	2	..	5	2	1	1	2	1	4	2	1	1	4	..	2	..	4	2	1	..	1	23	15	10	28	38
" Acute	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	..	..	..	..	..	2	....	1	1	2
Perityphlitis	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	....	...	1	1

TABLE VIII.—CAUSES OF DEATH, 1883.—Continued.

CAUSES OF DEATH.	Jan.		Feb.		Mar.		April.		May.		June.		July.		Aug.		Sept.		Oct.		Nov.		Dec.		PARENTAGE.		SEX.		
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	Am.	For.	M.	F.	Total.
Pharyngitis	1	1						1	1						1										4	1	3	2	5
Pleurisy	3				1	1								2	1		1			1		1	1	1	9	4	7	6	13
Pneumonia	24	30	11	22	27	30	26	30	22	25	14	11	7	3	5	2	9	5	7	10	13	8	11	14	177	189	176	190	366
Pregnancy						1				1															1	1	...	2	2
Prostate, Disease of	1		1		1						1						1						2		5	2	7	...	7
Purpura		1														1			1						2	1	1	2	3
Pyæmia	1		1		1						1											1			3	2	4	1	5
Rheumatism	3								3							1	2	2	3		1	2			14	3	12	5	17
" Acute					2				1	2		1													3	3	3	3	6
" Chronic						1										1						1		1	1	3	...	4	4
Scarlatina	2	1	3	1		1	3	1	3	2				1		1	1	1		3	4	1	1	4	14	20	17	17	34
Scrofula	1	1	1		2						1		1					1	2	1			2	3	10	6	10	6	16
Septicæmia														1				1					1		2	1	1	2	3
" Puerperal																		1		1					1	1	...	2	2
Small-Pox	1																								1	....	1	...	1
Spine, Disease of				1				2				2						1			3	1	1		6	5	4	7	11
" Inflammation of		1					1			1						2									5	....	1	4	5
Starvation		1																							1	....	...	1	1
Stenosis																					1				1	....	1	...	1
Stomach, Disease of				1			1		1		2	1		2	2	3	1	1				1			9	7	7	9	16
" Inflammation of																1								1	....	2	...	2	2
Suicide	3				1		3		2	2		1	1		4	1	2		1	1			1	2	11	14	18	7	25
Sunstroke														1											....	1	...	1	1
Syphilis		3			1	1			1				1		3		1		1	1	1	1	2	1	7	11	11	7	18

CAUSES OF DEATH.	Jan.		Feb.		Mar.		April.		May.		June.		July.		Aug.		Sept.		Oct.		Nov.		Dec.		PARENTAGE.		SEX.		
	M.	F.	M.	F.	M.	F	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	Am.	For.	M.	F.	Total.
Tabes Mesenterica			1				1						1						1		1				4	1	5	...	5
Teething		1		2		1		1			4	3	3	1	2	1	3	1	1	1	4	1			16	14	17	13	30
Tetanus													2		1							1			1	3	3	1	4
Thrombosis Pulmonum						1																			1	....	...	1	1
Thrush					1							1													1	1	1	1	2
Trismus Nascentium					1						1			1			1								3	1	3	1	4
Tuberculosis			2	4		1		1	2	2	1	1	2		1		1	1	1	1	3	3		2	18	11	13	16	29
Tumors		1															1	1	1						4	....	2	2	4
" of Abdomen		1				1												1							2	1	...	3	3
" of Brain										1		1								1					3	....	...	3	3
" of Liver			1																						....	1	1	...	1
" Ovarian										2				1						1		2			3	3	...	6	6
" of Stomach																	1								1	...	1	...	1
" of Uterus								1				1				1				1		2			4	2	...	6	6
Ulcer of Neck																							1		....	1	1	...	1
Uræmia							1								1	1									2	1	2	1	3
Urine, Retention of														1			1								1	1	1	1	2
Uterus, Disease of						1						1										1			2	1	...	3	3
" Rupture of																						1			....	1	...	1	1
Varicella																							1		1	....	1	...	1
Vomiting					1															1					1	1	2	...	2
Whooping Cough	2				1	2							1		1							1	1		5	4	6	3	9
Unknown	8	6	5	3	9	6	7	8	10	9	9	10	11	8	8	7	7	3	9	8	10	9	11	5	88	98	104	82	186
" Sudden				1						1			1												2	1	1	2	3

TABLE IX.—CAUSES OF DEATH, 1883.

Arranged Alphabetically; showing the Number of each Sex, who died from each cause, in each Period of Life.

CAUSES OF DEATH.	Under 1.		1 and under 2.		2 to 5.		5 to 10.		10 to 15.		15 to 20.		20 to 30.		30 to 40.		40 to 50.		50 to 60.		60 to 70.		70 to 80.		80 and over.		Age not stated.		SEX.		
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	Total.
Accidents (various)	1				2		1	1	5		3		2		5		4		5		2	1	4	3	2	2	1		36	7	43
" Asphyxia	2	2	1		1	3												1	1		1								6	6	12
" Burns and Scalds	2		3	1	4	2		2			1				1	1								1					11	7	18
" Drowning					1		9		5	1	1		2		1	2			2	2						1			21	6	27
" Falls			1					1		1			2		3				2		3	2	2	3		1			13	8	21
" Poisoning		1	1										1			1	1		1										4	2	6
" Railroad							1		1		2		6		2		1		1		1				1				16		16
Abscesses	1		2												1			1			1	1	1	2					6	4	10
" of Brain										1										1										2	2
" of Leg																							1						1		1
" Lumbar																							1						1		1
" of Lungs																		1			1								1	1	2
" Pelvic														1																1	1
" of Prostate																									1				1		1
Abortion												1		1		2														4	4
Adenitis	1														1														2		2
Alcoholism													2		2	4	2	4	1	3	1		2						10	11	21
Anæmia	1	1												1				1			1	1							2	4	6
Anasarca																				1										1	1
Aneurism, Abdominal															1				1										2		2
" of Aorta															1				1	1	2								4	1	5

CAUSES OF DEATH.	Under 1.		1 and under 2.		2 to 5.		5 to 10.		10 to 15.		15 to 20.		20 to 30.		30 to 40.		40 to 50.		50 to 60.		60 to 70.		70 to 80.		80 and over.		Age not stated.		SEX.		
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	Total.
Aneurism, Cerebral																			1										1	...	1
Apoplexy	1						1						2	1	2	7	6	5	9	20	18	19	23	17	12	14			74	83	157
Ascites						1																							...	1	1
Asthenia	2				1			2									1			1	2	2							6	5	11
Asthma					1								1		1		1		1	1	4	1		2					9	4	13
Atelectasis Pulmonum	4	1																											4	1	5
Bladder, Disease of														1									2						2	1	3
" Inflammation of							1														4		2		1				8	...	8
Bones, Disease of																		1											...	1	1
Bowels, Disease of	1		2											1	1														4	1	5
" Intussusception of																					1								1	...	1
" Perforation of														1															...	1	1
" Stricture of																			1										1	...	1
" Ulceration of																	1		1				1						3	...	3
Brain, Disease of	10	2	2		1	2	1		1		1	1		1	1		2		2	3	1		1	1	1	1			24	11	35
" Congestion of	3	2	3	2	2	1	3	1		1						1				1		1	1	2					12	12	24
" Inflammation of	13	10	8	5	9	9	8	5	3	2	3		2	2		4		1	3	1		1		1		1			49	42	91
" Softening of																1	1	1	4	2	1	2	3	4	1	1			10	11	21
Bronchitis	9	9	4	1	4	2		1					1	1	2	1	2	1	2	2	1	3	4	2	1	3			30	26	56
" Acute	11	6	1	4	3			1											1			1	1						17	12	29
" Chronic		1				1										2		1		4	3	2	6	2		4			9	17	26
Cancer (various)													2	1	1	2		8	2	8	6	10	3	7		4		1	14	41	55
" of Abdomen																	1				1		1						3	...	3
" of Breast																2		6		10		1		2					...	21	21
" of Bladder																			1										1	...	1

TABLE VIII.—CAUSES OF DEATH, 1883.—Continued.

CAUSES OF DEATH.	Under 1.		1 and under 2.		2 to 5.		5 to 10.		10 to 15.		15 to 20.		20 to 30.		30 to 40.		40 to 50.		50 to 60.		60 to 70.		70 to 80.		80 and over.		Age not stated.		SEX.		
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	Total.
Cancer of Bowels																			1	2									1	2	3
" of Chest																			1										1		1
" of Face															1		1		1						1				4		4
" of Liver															2	1	1	2		7	2								5	10	15
" of Neck																							1						1		1
" of Omentum																				1						1				2	2
" of Ovaries																		1												1	1
" of Pancreas																					1								1		1
" of Prostate																					1								1		1
" of Rectum																	1			1	1				1				3	1	4
" of Spleen																						1								1	1
" of Stomach															1		1	1	3	5	5	2	3	2	1	2			14	12	26
" Sub-Maxillary																			1										1		1
" of Throat																	1												1		1
" of Uterus																6		4		8		2		3		4				27	27
Carbuncle																	1		1	1									2	1	3
Catarrh		1	1																										1	1	2
Cellulitis Pelvic																1		1												2	2
Cerebritis																			1					1					1	1	2
Child-Birth														15		14		3												32	32
" Puerperal Conv.														1																1	1
" " Fever														5		5		1												11	11
Cholera		1																								1				2	2

CAUSES OF DEATH.	Under 1.		1 and under 2.		2 to 5.		5 to 10.		10 to 15.		15 to 20.		20 to 30.		30 to 40.		40 to 50.		50 to 60.		50 to 60.		70 to 80.		80 and over.		Age not stated.		SEX.		
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M	F.	M.	F.	M.	F.	M.	F.	Total.
Cholera Infantum	93	88	23	19		3		1																					116	111	227
" Morbus		1				1	1						3	1		2		2	3	1	3	3		1		1			10	13	23
" Winter												1												1						2	2
Chorea														1																1	1
Colic		1																			2		1						3	1	4
Coma																							1	1					1	1	2
Consumption	8	6	5	2	3		3	1	1	9	29	45	117	133	61	89	54	47	32	34	27	21	14	10	1	7	3	4	358	408	766
Convulsions	41	35	7	11	4	3	6	1							3					1									61	51	112
" Uræmic																	1												1	...	1
Cancrum Oris	1																												1	...	1
Croup	6	6	7	12	14	14	4	6	1							1													32	39	71
Cyanosis	6	5																											6	5	11
Debility	39	30	3	2	1	1	1	1	1					2		1		3	1	1	4	5	2	5				1	52	52	104
" Exhaustion	9	7		1		1				1		1	1	3		2		2	2	3	3		4	5	1		1	1	21	27	48
" Premature Birth	19	21																											19	21	40
Delirium Tremens															5	1	1		1										7	1	8
Diabetes								1	1					1	1		1		1	1	1	1	1	1					6	5	11
" Mellitus													1				1			1	1								3	1	4
Diarrhœa	18	34	8	3	2		1								1	3	1	3	7	2	6		2	3	5	5			51	53	104
" Chronic	4	1											2		1	1	3	1				1	3	1	1	4	1		15	9	24
Diphtheria	5	4	6	9	14	20	13	18	1	2		1		1										1					39	56	95
Dropsy		1					1					1	1	1	4	2	1	4	1	2	5	5	7	6	1	3			21	25	46
" of Chest																				1										1	1
Dysentery	12	5	1	3	1	1	1	2				1	1			3		1	3	1	1	6		4		5			20	32	52
" Chronic																								1						1	1

TABLE VIII.—CAUSES OF DEATH, 1883.—Continued.

CAUSES OF DEATH.	Under 1.		1 and under 2.		2 to 5.		5 to 10.		10 to 15.		15 to 20.		20 to 30.		30 to 40.		40 to 50.		50 to 60.		60 to 70.		70 to 80.		80 and over.		Age not stated.		SEX.		
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	Total.
Dysentery, Typhoid																		1												1	1
Dyspnea																			1				1						2		2
Embolism									1							1							1	1					2	2	4
Emphysema																							1						1		1
Empyema								1																						1	1
Enteritis	5	4	5	1	1					1	1	1	1	1		2		2		2	3	1		1					16	16	32
" Gastro	4	5	1			1								1						1		2	1	3					6	13	19
" " Chronic															1							1							1	1	2
Entero Colitis	1	2	1	1																	1								3	3	6
Epilepsy					1		1	1		1		1	2	1			2	1	1	1	1	1		2				1	8	10	18
Erysipelas	1	2									1					2	3		1		3	3	3	1	1	2			13	10	23
Exposure	2														1														3		3
" to Cold													2						2										4		4
Fever	1	2	1			1							2																4	3	7
" Bilious																									1				1		1
" Intermittent																							1						1		1
" Malarial			1										1	1							1	1		1					3	3	6
" " Typho									1		1										1			1					3	1	4
" Remittent	1																												1		1
" Typhoid	2		4		5	4	8	6	5	19	27	18	46	24	18	13	5	7	4	7	4	3	2	3	1		1	1	132	105	237
" Typhus													1																1		1
Fits	2	4		1	1										1	1					2		1		1				8	6	14
Gall Stones																								1						1	1

CAUSES OF DEATH.	Under 1.		1 and under 2.		2 to 5.		5 to 10.		10 to 15.		15 to 20.		20 to 30.		30 to 40.		40 to 50.		50 to 60.		60 to 70.		70 to 80.		80 and over.		Age not stated.		SEX.		
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	Total.
Gangrene																	1			1			2	2	1				4	3	7
" of Intestine	1																												1		1
Gastralgia																1														1	1
Gastritis						1										1	1	1	1		1		1			1	1		5	4	9
Gastritis, Acute																							1			1			1	1	2
" Chronic																		1	1	2	1	2	1	2					3	7	10
Gastro Colitis			1																										1		1
Heart, Disease of	2	3	1	1	1	1	3		3	2	6	3	7	2	8	7	16	12	19	24	22	30	35	26	14	11			137	122	259
" Dilatation of																							2	1					2	1	3
" Dropsy of																		1	1			1		1					1	3	4
" Fatty Degeneration of																			1	1	2		1	3					4	4	8
" Hypertrophy of	1															1		1		1	1				1				3	3	6
" Inflammation of						1		3			2	1	3		2	1		1	1		1	1							9	8	17
" Neuralgia of																					1								1		1
" Paralysis of		1									1					1		1	1	1		1	3	1					5	6	11
" Rheumatism of											1									1				1					1	2	3
" Valvular Disease of												1		1				1		1	2	3							2	7	9
Hæmatemesis																			1										1		1
Hæmaturia																					1								1		1
Heat														1																1	1
Hemiplegia														1			1	3			1			2		1			2	7	9
Hæmoptysis																		1					1						1	1	2
Hemorrhage	2												1	1	1	2		1		1									4	5	9
" of Bowels																	1												1		1
" of Lungs		1							1						1	1	4				1								7	2	9

Table VIII.—CAUSES OF DEATH, 1883.—Continued.

CAUSES OF DEATH.	Under 1.		1 and under 2.		2 to 5.		5 to 10.		10 to 15.		15 to 20.		20 to 30.		30 to 40.		40 to 50.		50 to 60.		60 to 70.		70 to 80.		80 and over.		Age not stated.		SEX.		
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	Total.
Hemorrhage from Mouth																	1												1		1
" from Placenta														1																1	1
" Umbilical	2																												2		2
Hemorrhoids																			1										1		1
Hernia		1													1			1				2	2						3	4	7
Hip, Disease of								1																						1	1
Hip-joint, Disease of							1				1		1																3		3
Hydrocephalus	10	9	2	7	5	5	1		1		1			1									1				1		22	22	44
Hydrothorax																	1												1		1
Inanition	5	3																				1							5	4	9
Influenza														1						1		1								3	3
Innutrition		1																												1	1
Intussusception		1															1												1	1	2
Insanity													1			1	5	6	2	3	2	1	1	5		1	1		12	17	29
Jaundice		2											1		1						1								3	2	5
Kidneys, Disease of	1										2		2	1			1	1		4	4	2	6	1	2				18	10	28
" Brights Disease of									2		2		4	7	4	4	6	6	13	13	8	4	6	4	1			1	46	39	85
Laryngitis	1		1					1					1		1														4	1	5
Leucocythæmia																							1						1		1
Lightning Stroke																				1										1	1
Liver, Disease of	1								1					1	1	1	3	1	1	2	1	2		3		3			8	13	21
" Cirrhosis of																1	2	1	5	1	2	1	1			1			10	5	15
" Hypertrophy of																				1			1						1	1	2

CAUSES OF DEATH.	Under 1.		1 and under 2.		2 to 5.		5 to 10.		10 to 15.		15 to 20.		20 to 30.		30 to 40.		40 to 50.		50 to 60.		60 to 70.		70 to 80.		80 and over.		Age not stated.		SEX.		
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	Total.
Liver, Inflammation of.															2			2	1		1					1			5	2	7
Locomotor Ataxia															1		2		1										4		4
Lungs, Disease of	2	1									1			1								1	2	2	1				6	5	11
" Congestion of	6	3	2	3	1		1	1					2				1	1		1			3	5		4			16	18	34
" Gangrene of													1																1		1
" Œdema of																1		1			1			1					1	3	4
Malaria	1				1		1	1						1					1						1				5	2	7
" Typhoid																								1						1	1
Malformations	11	6																											11	6	17
Malnutrition.	1																												1		1
Mammitis							1																						1		1
Marasmus	37	19	1	2	2	2							1	1							2	2							43	26	69
" Senile																						1		1						2	2
Measles.		1	1	1	5	1	3						2																11	3	14
Meningitis, Spinal.	1			1			1	1		1						2					1								3	5	8
" Cerebro Spinal	2		1	2	4	7	2	1	1	2	1	1	1			1													12	14	26
" Tubercular	4		1		2		1	2																					8	2	10
Metritis												1		1		2														4	4
" Puerperal														2		1														3	3
Mortification																									1				1		1
Mumps	2																												2		2
Murder.																	2		1										3		3
Nephritis.							1						1	1	1	1				1			1			1			4	4	8
Obstipation									1						1	1			1		2	3	2						7	4	11
Old Age.																					4	6	36	42	65	122			105	170	275

TABLE IX.—CAUSES OF DEATH, 1883.—Continued.

CAUSES OF DEATH.	Under 1.		1 and under 2.		2 to 5.		5 to 10.		10 to 15.		15 to 20.		20 to 30.		30 to 40.		40 to 50.		50 to 60.		60 to 70.		70 to 80.		80 and over.		Age not stated.		SEX.		
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F	Total.
Opium Habit													1								2	1							3	1	4
Ovariotomy																1													...	1	1
Paralysis	1			1						1		2		1		2	6	2	9	7	11	8	26	17	10	13			63	54	117
Parotitis																							1						1	...	1
Peritonitis	2	2			1			1	3	2			3	7		7	1	3		2		1		1		2			10	28	38
" Acute																1			1										1	1	2
Perityphlitis																				1									...	1	1
Pharyngitis		1					1								1	1					1								3	2	5
Pleurisy													2		1			1	3	2	1	2		1					7	6	13
Pneumonia	17	21	13	10	6	6	7	6	1	1	4	9	17	13	15	18	19	19	31	21	24	25	15	23	6	17	1	1	176	190	366
Pregnancy														1		1													...	2	2
Prostate, Disease of																					2		4		1				7	...	7
Purpura	1																	1			1								1	2	3
Pyæmia											1				2		1	1											4	1	5
Rheumatism									1	1			1	1	1	1	2		2		2	1	3	1					12	5	17
" Acute									1						1	1	1					2							3	3	6
" Chronic																				1		1		2					...	4	4
Scarlatina	1		2	3	9	8	5	6																					17	17	34
Scrofula	3	1	1	1	2		1		1	1		1	2			1								1					10	6	16
Septicæmia		1																			1	1							1	2	3
" Puerperal																2													...	2	2
Small-Pox													1																1	...	1
Spine, Disease of	1	1				1	1	1					1	1					1			2				1			4	7	11

CAUSES OF DEATH.	Under 1.		1 and under 2.		2 to 5.		5 to 10.		10 to 15.		15 to 20.		20 to 30.		30 to 40.		40 to 50.		50 to 60.		60 to 70.		70 to 80.		80 and over.		Age not stated.		SEX.		
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	Total.
Spine, Inflammation of		3									1											1							1	4	5
Starvation																				1										1	1
Stenosis	1																												1		1
Stomach, Disease of	2	1												1			1	2		2	2	2	2	1					7	9	16
" Inflammation of																2														2	2
Suicide													4	4	3		5	2	2			1	2		1		1		18	7	25
Sunstroke																		1												1	1
Syphilis	6	4		1									2		1		2	1		1									11	7	18
Tabes Mesenterica	3		1												1														5		5
Teething	10	7	7	5		1																							17	13	30
Tetanus									2					1					1										3	1	4
Thrombosis Pulmonum		1																												1	1
Thrush	1	1																											1	1	2
Trismus Nascentium	3	1																											3	1	4
Tuberculosis	5	2					1			1	1	3	1	6	2	1			1	1	1	1	1	1					13	16	29
Tumors															1					1			1	1					2	2	4
" of Abdomen														1						1		1								3	3
" of Brain								1								1		1												3	3
" of Liver															1														1		1
" Ovarian														2				1		1		2								6	6
" of Stomach																			1										1		1
" of Uterus																1		3		1				1						6	6
Ulcer of Neck	1																												1		1
Uræmia																			1			1			1				2	1	3
Urine, Retention of																		1			1								1	1	2

TABLE IX.—CAUSES OF DEATH, 1883.—Continued.

CAUSES OF DEATH.	Under 1.		1 and under 2.		2 to 5.		5 to 10.		10 to 15.		15 to 20.		20 to 30.		30 to 40.		40 to 50.		50 to 60.		60 to 70.		70 to 80.		80 and over.		Age not stated.		SEX.		
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	Total.
Uterus, Disease of	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	1	..	..	..	..	..	..	..	..	...	3	3
" Rupture of	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	...	1	1
Varicella	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	...	1
Vomiting	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	...	2
Whooping Cough	5	1	..	2	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6	3	9
Unknown	28	29	14	1	6	5	3	..	..	..	..	3	5	5	3	6	6	3	6	6	12	6	12	10	7	7	2	1	104	82	186
" Sudden	..	..	..	..	1	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	1	2	3

TABLE X.—CLASSIFICATION AND PERCENTAGE, 1883.

Showing what part of the Mortality in the whole State, and in each Division, is ascribed to each specified cause and class of causes.

Number of Deaths in each Division of the State.										Percentage of Deaths in each Division.						
Bristol County.	Kent County.	Newport County Towns.	Newport City.	Providence County Towns.	Providence City.	Washington County.	Whole State.	CAUSES OF DEATH.	Percentage in the Whole State.	Washington County.	Providence City.	Providence County Towns.	Newport City.	Newport County Towns.	Kent County.	Bristol County.
202	302	119	311	1,770	2,357	221	5,282	All Causes								
197	283	112	289	1,656	2,351	208	5,096	Causes Specified	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
5	19	7	22	114	6	13	186	Causes not Specified	......	......	......	......	......	......	......	......
								CLASSES.								
35	47	16	56	366	521	32	1,072	I. ZYMOTIC DISEASES	21.01	15.36	22.00	22.40	19.37	14.40	16.45	18.50
35	61	17	60	374	537	43	1,126	II. CONSTITUTIONAL DISEASES	22.27	24.74	23.00	22.60	20.76	15.20	21.83	18.50
88	134	51	113	588	962	89	2,033	III. LOCAL DISEASES	39.90	40.70	41.20	35.56	39.10	45.00	47.70	44.00
31	29	26	51	246	249	36	668	IV. DEVELOPMENTAL DISEASES	13.28	17.28	10.50	14.96	17.64	23.60	11.22	15.50
5	8	2	9	71	82	4	181	V. VIOLENT DEATHS	3.54	1.92	3.30	4.48	3.13	1.80	2.80	3.50
								ORDERS.								
35	47	16	56	366	521	32	1,072	CLASS I. ZYMOTIC DISEASES.	21.01	15.36	22.00	22.40	19.37	14.40	16.45	18.50
								Order One.—Miasmatic Dis.								
...	...	...	...	1	2	...	3	Carbuncle	.06	......	.09	.06	......	......	......	......

TABLE X.—CLASSIFICATION AND PERCENTAGE, 1883.—Continued.

Number of Deaths in each Division of the State.										Percentage of Deaths in each Division.						
Bristol County.	Kent County.	Newport County Towns.	Newport City.	Providence County Towns.	Providence City.	Washington County.	Whole State.	CAUSES OF DEATH.	Percentage in the Whole State.	Washington County.	Providence City.	Providence County Towns.	Newport City.	Newport County Towns.	Kent County.	Bristol County.
...	...	...	...	...	...	2	2	Cholera, Sporadic	.04	.96	...	...	...	...	...	...
12	7	2	20	88	108	5	242	Cholera Infantum	4.73	2.40	4.69	5.28	6.92	1.80	2.47	6.00
...	...	...	3	9	11	...	23	Cholera Morbus	.45	...	.46	.54	1.03	...	...	...
1	6	2	2	25	35	...	71	Croup (Pseudo Membranous)	1.40	...	1.51	1.50	.70	1.80	2.11	.50
1	7	1	2	26	54	4	95	Diphtheria	1.88	1.92	2.54	1.56	.70	.90	2.47	.50
3	2	2	7	56	59	1	130	Diarrhœa	2.55	.48	2.33	3.36	2.40	1.80	.70	1.50
4	5	4	3	20	16	2	54	Dysentery	1.06	.96	.69	1.20	1.03	3.50	1.76	2.00
1	1	...	2	4	17	3	28	Erysipelas	.54	1.44	.73	.24	.70	...	.35	.50
...	...	...	...	...	...	1	1	Fever, Bilious	.02	.48	...	...	...	...	...	...
...	...	...	...	10	15	1	26	Fever, Cerebro Spinal	.50	.48	.65	.60	...	...	...	...
...	...	...	...	1	...	...	1	Fever, Intermittent	.02	...	...	.06	...	...	...	...
1	...	...	1	7	6	...	15	Fever, Malarial	.29	...	.26	.42	.35	...	...	.50
9	16	4	6	71	128	4	238	Fever, Typhoid	4.66	1.92	5.51	4.26	2.06	3.50	5.65	4.50
...	...	...	...	4	...	1	5	Fever, Typho-Malarial	.09	.48	...	.24	...	...	...	...
...	...	...	...	6	...	1	7	Fever, Unspecified	.13	.48	...	.36	...	...	...	...
...	1	...	...	3	8	2	14	Measles	.27	.96	.35	.18	...	...	.35	...
...	...	...	...	1	1	1	3	Mumps	.06	.48	.04	.06	...	...	...	...
1	...	...	...	4	4	1	9	Pertussis	.17	.48	.17	.24	...	...	...	.50
1	1	1	4	9	16	2	34	Scarlatina	.64	.96	.69	.54	1.40	.90	.35	.50

...	...	...	...	...	1	...	1	Small Pox	.02	...	.04	...	...	...	...	...
...	...	...	...	1	...	...	1	Varicella	.02	...	...	.06	...	...	...	...
								Order Two.—Enthetic Dis.								
...	...	...	2	...	1	...	3	Septicæmia	.06	...	.04	...	.70	...	...	...
...	...	...	2	6	10	...	18	Syphilis	.33	...	.43	.36	.70	...	...	...
								Order Three.—Dietic Dis.								
...	1	...	1	6	13	...	21	Alcoholism	.39	...	.56	.36	.35	...	.35	...
...	...	...	...	4	3	1	8	Delirium Tremens	.15	.48	.13	.24	...	...	...	...
...	...	...	...	...	10	...	10	Inanition	.19	...	.40	...	...	...	...	...
...	...	...	1	2	1	...	4	Opiumism	.07	...	.04	.12	.35	...	...	...
...	...	...	...	2	1	...	3	Purpura and Scurvy	.06	...	.04	.12	...	...	...	...
								Order Four.—Parasitic Dis.								
1	...	...	...	...	1	...	2	Apthæ	.04	...	.04	...	...	...	...	.50
35	61	17	60	374	537	43	1,126	CLASS II. CONSTITUTIONAL.	22.27	20.64	23.00	22.60	20.76	15.20	21.83	18.50
								Order One,—Diathetic Dis.								
6	1	5	1	25	4	5	47	Dropsy	.92	1.92	.17	1.50	.35	4.50	.35	3.00
...	...	...	1	...	5	1	7	Anæmia	.13	.48	.22	...	.35	...	...	...
3	14	3	6	33	35	1	95	Cancer, Various	1.85	.48	1.51	1.98	2.07	2.70	4.94	1.50
...	1	...	1	4	15	...	21	Cancer of Breast	.41	...	.65	.24	.35	...	.35	...
...	2	...	...	6	18	...	26	Cancer of Stomach	.51	...	.78	.36	...	...	.70	...
...	...	...	2	7	18	1	27	Cancer of Uterus	.53	.48	.78	.42	.69	...	...	...
...	...	...	...	1	...	...	1	Noma (Canker)	.02	...	...	.06	...	...	...	...
1	1	1	...	5	1	...	9	Mortification	.17	...	.04	.30	...	.90	.35	.50
2	...	...	1	10	11	3	27	Rheumatism	.53	1.44	.47	.60	.35	...	...	1.00

TABLE X.—CLASSIFICATION AND PERCENTAGE, 1883.—Continued.

Number of Deaths in each Division of the State.									Percentage of Deaths in each Division.							
Bristol County.	Kent County.	Newport County Towns.	Newport City.	Providence County Towns.	Providence City.	Washington County.	Whole State.	CAUSES OF DEATH.	Percentage in the Whole State.	Washington County.	Providence City.	Providence County Towns.	Newport City.	Newport County Towns.	Kent County.	Bristol County.
								Order Two.—Tubercular Dis.								
...	2	...	1	16	32	...	51	Scrofula	1.00	......	1.38	.96	.35	......	.70	......
1	1	...	...	1	2	...	5	Tabes Mesenterica	.09	......	.09	.06	......	......	.35	.50
19	39	8	47	257	364	32	766	Phthisis (Pulmonalis)	15.01	15.36	15.68	15.42	16.26	7.20	13.80	9.50
3	...	...	...	9	32	...	44	Hydrocephalus	.87	......	1.38	.54	......	......	......	1.50
88	134	51	113	588	962	89	2,033	CLASS III. LOCAL.	39.90	40.70	41.20	35.56	39.10	45.00	47.70	44.00
								Order One.—Diseases of the Nervous System.								
3	7	...	6	23	51	1	91	Encephalitis	1.79	.48	2.20	1.38	2.07	......	2.47	1.50
2	3	...	...	21	......	...	26	Cerebritis	.51	......	......	1.26	......	......	1.06	1.00
5	5	4	8	43	84	8	157	Apoplexy	3.08	3.84	3.62	2.58	2.76	3.60	1.76	2.50
6	23	3	7	32	34	13	118	Paralysis	2.31	6.24	1.47	1.92	2.41	2.70	8.12	3.00
1	2	...	...	7	18	1	29	Insanity	.55	.48	.78	.42	......	......	.70	.50
...	...	...	...	......	1	...	1	Chorea	.02	......	.04	......	......	......	......	......
...	...	...	7	......	8	3	18	Epilepsy	.33	1.44	.35	.42	......	......	......	......
1	1	...	2	2	2	...	8	Tetanus	.15	......	.09	.12	.69	......	.35	.50

5	11	2	4	41	62	1	126	Convulsions	2.47	.48	2.68	2.46	1.37	1.80	3.88	2.50
...	1	...	2	...	5	...	8	Spinal Meningitis	.15	...	.22	...	.69	...	.35	...
3	3	3	4	8	38	3	62	Brain Diseases	1.20	1.44	1.60	.48	1.37	2.70	1.06	1.50
								Order Two.—Diseases of the Circulatory System.								
...	...	...	...	...	7	1	8	Aneurism	.15	.48	.30	...	...	...	...	...
8	27	11	19	70	172	18	325	Heart Diseases	6.35	8.64	7.42	4.20	6.57	9.80	9.53	4.00
								Order Three.—Diseases of the Respiratory Organs.								
1	1	...	...	2	1	...	5	Laryngitis	.09	...	.04	.12	...	...	.35	.50
2	1	...	3	1	20	2	29	Bronchitis, Acute	.57	.96	.86	.06	1.03	...	.35	1.00
3	1	...	...	41	37	...	82	Bronchitis, Chronic	1.57	...	1.60	2.46	...	...	.35	1.50
...	1	1	1	2	7	1	13	Pleurisy	.25	.48	.30	.12	.35	.90	.35	...
19	21	12	22	108	204	14	400	Pneumonia	7.84	6.72	8.79	6.48	7.61	10.70	7.39	9.50
2	1	2	1	5	3	...	14	Asthma	.27	...	.13	.30	.35	.90	.35	1.00
...	1	6	...	14	11	2	34	Lung Diseases	.66	.96	.48	.84	...	5.40	.35	...
								Order Four.—Diseases of the Digestive Organs.								
1	2	...	...	15	17	...	35	Gastritis	.67	...	.73	.90	...	...	.70	.50
3	...	...	6	20	18	...	47	Enteritis	.92	...	.78	1.20	2.07	...	...	1.50
4	1	...	3	10	22	...	40	Peritonitis	.78	...	.95	.60	1.03	...	.35	2.00
...	...	...	...	1	...	...	1	Ascites	.02	...	...	.06	...	...	...	...
...	...	...	...	4	...	...	4	Ulceration of Intestines	.07	...	...	.24	...	...	...	...
2	2	...	...	...	3	...	7	Hernia	.13	...	.13	...	...	...	.70	1.00
...	...	...	3	2	5	1	11	Ileus	.21	.48	.22	.12	1.03	...	...	...
...	...	...	...	1	2	...	3	Intussusception	.06	...	.09	.06	...	...	...	...
...	...	...	...	...	1	...	1	Stricture of Intestines	.02	...	.04	...	...	...	...	...
1	2	...	...	6	5	2	16	Stomach Diseases	.31	.96	.22	.36	...	...	.70	.50

Table X.—CLASSIFICATION AND PERCENTAGE, 1883.—Continued.

Number of Deaths in each Division of the State.										Percentage of Deaths in each Division.						
Bristol County.	Kent County.	Newport County Towns.	Newport City.	Providence County Towns.	Providence City.	Washington County.	Whole State.	CAUSES OF DEATH.	Percentage in the Whole State.	Washington County.	Providence City.	Providence County Towns.	Newport City.	Newport County Towns.	Kent County.	Bristol County.
3	...	...	1	.....	3	...	7	Hepatitis	.13	......	.13	......	.35	......	......	1.50
...	2	...	...	3	1	...	6	Jaundice	.11	......	.04	.18	......	......	.70	......
2	4	...	3	13	14	2	38	Liver Diseases	.70	.96	.60	.78	1.03	......	1.40	1.00
...	3	...	2	8	6	1	20	Bowel Diseases	.39	.48	.26	.48	.69	......	1.05	......
								Order Five.—Diseases of the Urinary Organs.								
1	...	...	...	7	.....	...	8	Nephritis	.15	......	......	.42	......	......	......	.50
2	2	4	11	26	34	6	85	Nephria (Bright's Disease)	1.60	2.88	1.47	1.56	3.80	3.60	.70	1.00
...	1	1	1	2	6	4	15	Diabetes	.29	1.92	.26	.12	.35	.90	.35	......
1	...	...	...	.....	.....	...	1	Calculus (Gravel, &c.)	......	......	......	......	......	......	......	.50
...	1	...	2	4	.....	1	8	Cystitis	.15	.48	......	.24	.69	......	.35	......
...	...	...	...	.....	7	...	7	Prostate, Disease of	.13	......	.30	......	......	......	......	......
2	...	1	1	4	26	2	36	Kidney Diseases	.68	.96	1.12	.24	.35	.90	......	1.00
1	...	...	...	7	5	...	13	Bladder, Diseases of	.25	......	.20	.42	......	......	......	.50
								Order Six.—Diseases of the Generative Organs. Female.								
1	...	...	2	.....	3	...	6	Ovarian Dropsy	.11	......	.13	......	.69	......	......	.50

...	...	1	...	9	10	...	20	Diseases of Uterus	.39	...	.44	.54	...	.90	...	...
								Order Seven.—Osseous and Locomotory System.								
...	...	...	...	...	2	...	2	Bones, Diseases of	.04	...	.09	...	...	...	...	...
2	2	...	1	14	4	1	24	Vertebræ, Diseases of	.45	.48	.17	.84	.35	...	.70	1.00
								Order Eight.—Integumentary System.								
1	2	...	...	11	3	1	18	Abscesses	.34	.48	.13	.66	...	...	.70	.50
...	...	...	...	1	...	...	1	Ulcer	.02	...	...	.06	...	...	...	...
31	29	26	51	246	249	36	668	CLASS IV. DEVELOPMENTAL.	13.28	17.28	10.50	14.96	17.64	23.60	11.22	15.50
								Order One.—Developmental Diseases of Children.								
3	2	...	...	31	21	3	60	Debility, Infantile	1.14	1.44	.90	1.86	...	...	.70	1.50
4	...	1	5	4	26	...	40	Debility, Premature Birth	.76	...	1.12	.24	1.73	.90	...	2.00
1	...	...	2	10	4	...	17	Cyanosis	.32	...	.17	.60	.69	...	...	.50
...	1	...	2	3	13	...	19	Malformations	.36	...	.56	.18	.69	...	.35	...
1	2	1	...	9	14	3	30	Teething	.57	1.44	.60	.54	...	.90	.70	.50
2	...	...	1	40	52	...	95	Innutrition	1.80	...	2.23	2.40	.35	...	...	1.00
								Order Two.—Developmental Diseases of Women.								
...	...	...	...	2	...	...	2	Paramenia	.04	...	...	.12	...	...	...	...
1	5	6	3	14	27	2	58	Childbirth	1.10	.96	1.16	.84	1.03	5.40	1.76	.50

TABLE X.—CLASSIFICATION AND PERCENTAGE, 1883.—Continued.

Number of Deaths in each Division of the State.										Percentage of Deaths in each Division.						
Bristol County.	Kent County.	Newport County Towns.	Newport City.	Providence County Towns.	Providence City.	Washington County.	Whole State.	CAUSES OF DEATH.	Percentage in the Whole State.	Washington County.	Providence City.	Providence County Towns.	Newport City.	Newport County Towns.	Kent County.	Bristol County.
								Order Three.—Developmental Diseases of Old People.								
17	18	15	29	91	84	21	275	Old Age	5.22	10.08	3.62	5.46	10.03	13.40	6.35	8.50
								Order Four.—Diseases of Nutrition. Adolescent and Adult.								
...	...	...	1	8	3	...	12	Atrophy	.22	......	.13	.48	.35	......	......	......
2	1	3	8	34	5	7	60	Debility	1.14	3.36	.22	2.04	2.76	2.70	.35	1.00
5	8	2	9	71	82	4	181	CLASS V. VIOLENT DEATHS.	3.54	1.92	3.30	4.48	3.13	1.80	2.80	3.50
								Order One.—Accident or Negligence.								
...	3	...	2	11	24	2	42	Fractures and Contusions	.79	.96	1.03	.66	.69	......	1.05	......
1	2	...	1	5	9	...	18	Burns and Scalds	.33	......	.39	.30	.35	......	.70	.50
...	1	...	1	1	3	...	6	Poison	.11	......	.13	.06	.35	......	.35	......
2	...	...	1	16	7	1	27	Drowning	.51	.48	.30	.96	.35	......	......	1.00

1	...	...	2	9	.....	...	12	Suffocation	.22	.....	.....	.54	.69	.....	.....	.50
...	2	1	1	21	23	...	48	Various	.88	.....	.99	1.26	.35	.90	.70	.....
1	...	...	...	.....	1	1	3	*Order Two.—Homicide.*	.06	.48	.04	.....	.....	.....	.....	50
...	...	1	1	8	15	...	25	*Order Three.—Suicide.*	.47	.....	.65	.48	.35	.90	.....	.....
3	4	...	...	9	.....	...	16	Unclassified	.31	.....	.....	.54	.....	.....	1.40	1.50
5	19	7	22	114	6	13	186	Cause not specified	3.53	6.24	.25	6.84	7.61	6.27	6.65	2.50

Table XI.—OCCUPATIONS AND AGES AT DEATH, 1883.

Showing the Average Age, at Death, in the several occupations; Providence City being separated from the rest of the State; and ages under twenty being excluded.

OCCUPATIONS.	PROVIDENCE CITY.			REST OF STATE.			WHOLE STATE.		
	Number of Decedents.	Aggregate Age.	Average Age.	Number of Decedents.	Aggregate Age.	Average Age.	Number of Decedents.	Aggregate Age.	Average Age.
I. Agricuture.									
Farmers	9	655	72.76	129	8,835	68.50	138	9,490	69.60
Florists	...	...	.....	...	...	.....	1	68	68.00
Gardeners	1	52	52.00	2	92	46.00	3	144	48.00
II. Professional and Personal Services.									
Architect	1	25	25.00	...	...	.....	1	25	25.00
Authors	...	...	.....	...	...	.....	1	72	72.00
Barbers	2	107	53.50	3	69	23.00	5	176	35.20
Civil Engineers	...	...	.....	...	...	.....	1	46	46.00
Clergymen	3	221	73.66	5	299	59.20	8	520	65.00
Clerks and Salesmen	22	779	35.40	10	306	30.60	32	1,085	34.00
Coachmen	2	86	43.00	4	126	31.50	6	212	35.33
Contractors	2	123	61.50	...	...	.....	2	123	61.50
Cooks	6	292	48.66	...	...	.....	6	292	48.66
Dentists	2	117	58.50	...	...	.....	2	117	58.50
Hostlers	2	97	48.50	2	79	39.50	4	176	44.00
Hotel keepers	...	...	.....	...	...	.....	2	98	49.00
Laborers	141	7,069	50.12	125	6,788	54.30	266	13,851	52.00
Lawyers	1	64	64.16	...	...	.....	1	64	64.00
Musicians	...	...	.....	...	...	.....	2	79	39.50
Nurses	...	...	.....	...	...	.....	1	21	21.00
Photographers	...	...	.....	...	...	.....	1	44	44.00
Physicians	2	133	66.50	2	132	66.00	4	265	66.50
Policemen	3	115	38.33	...	...	.....	3	115	38.33
Saloon keepers	5	243	48.60	2	92	46.00	7	335	48.00
Stable keepers	1	73	73.00	3	231	77.00	4	304	76.00
Steward	1	59	59.00	...	...	.....	1	59	59.00
Students	...	...	.....	...	...	.....	3	65	21.66
Teachers	6	332	55.33	4	106	26.50	10	438	43.80
Waiters	1	26	26.00	...	...	.....	1	26	26.00
Watchmen	...	...	.....	...	...	.....	4	188	47.00

TABLE XI.—OCCUPATIONS, 1883.—Continued.

OCCUPATIONS.	PROVIDENCE CITY.			REST OF STATE.			WHOLE STATE.		
	Number of Decedents.	Aggregate Age.	Average Age.	Number of Decedents.	Aggregate Age.	Average Age.	Number of Decedents.	Aggregate Age.	Average Age.
III. TRADE AND TRANSPORTATION.									
Agents (Various)	...	.....	.....	9	400	44.44	9	400	44.44
Apothecaries	2	61	30.50	...	.....	.....	2	61	30.50
Book-keepers	7	337	48.14	4	149	37.25	11	476	43.42
Brakemen	...	.....	.....	1	27	27.00	1	27	27.00
Brokers	2	154	77.00	5	312	62.40	7	466	66.57
Butchers	...	.....	.....	2	68	34.00	2	68	34.00
Conductors	1	39	39.00	1	39	39.00	2	78	39.00
Expressmen	2	103	51.50	5	230	46.00	7	333	47.57
Fireman	...	.....	.....	1	50	50.00	1	50	50.00
Fishermen and Oystermen	3	135	45.00	5	305	61.00	8	440	55.00
Grocers	7	342	48.85	12	639	53.25	19	981	50.14
Hackmen	1	43	43.00	...	.....	.....	1	43	43.00
Liquor Dealers	4	169	42.50	5	175	35.00	9	344	37.11
Mariners	5	267	53.40	6	329	54.83	11	596	54.10
Marketmen	3	160	53.33	...	.....	.....	3	160	53.33
Merchants	20	1,302	65.00	14	843	60.20	34	2.145	63.00
Peddlers	3	156	52.00	1	70	70.00	4	226	56.50
Porters	2	132	66.00	...	.....	.....	2	132	66.00
R. R. Station Agent	...	.....	.....	1	74	74.00	1	74	74.00
Sea Captains	3	153	51.00	5	351	70.20	8	504	63.00
Ship Chandlers	...	.....	.....	1	60	60.00	1	60	60.00
Teamsters	2	86	43.00	17	688	40.47	19	774	40.60
Traders and Dealers	6	263	43.83	8	425	53.12	14	688	49.00
IV. MANUFACTURES, MECHANICAL AND MINING INDUSTRIES.									
Bakers	1	37	37.00	2	62	31.00	3	99	33.00
Blacksmiths	6	271	45.00	10	677	67.70	16	948	59.25
Boat builders	...	.....	.....	1	59	59.00	1	59	59.00
Boiler makers	3	139	46.33	...	.....	.....	3	139	46.33
Boot and Shoe makers	5	318	53.00	10	548	54.80	15	866	57.70
Brewers	1	27	27.00	...	.....	.....	1	27	27.00
Cabinet makers	1	89	89.00	...	.....	.....	1	89	89.00

TABLE XI.—OCCUPATIONS, 1883.—Continued.

OCCUPATIONS.	PROVIDENCE CITY. Number of Decedents.	PROVIDENCE CITY. Aggregate Age.	PROVIDENCE CITY. Average Age.	REST OF STATE. Number of Decedents.	REST OF STATE. Aggregate Age.	REST OF STATE. Average Age.	WHOLE STATE. Number of Decedents.	WHOLE STATE. Aggregate Age.	WHOLE STATE. Average Age.
Carpenters	16	894	55.12	41	2,428	59.20	57	3,322	58.30
Carriage makers	1	46	46.00	1	28	28.00	2	74	37.00
Cigar makers	1	23	23.00	...	......	.....	1	23	23.00
Coopers	2	116	58.00	2	99	49.50	4	215	53.75
Designers	1	56	56.00	...	......	.....	1	56	56.00
Die sinkers	1	26	26.00	...	......	.....	1	26	26.00
Dyers	2	86	43.00	2	61	30.50	4	147	36.75
Engineers	3	122	40.66	6	266	44.33	9	388	43.11
Engravers	1	26	26.00	...	......	.....	1	26	26.00
File cutters	1	54	54.00	2	59	29.50	3	113	37.66
Gas fitters	1	61	61.00	2	69	34.50	3	120	40.00
Gilder	1	29	29.00	...	......	.....	1	29	29.00
Glaziers	1	54	54.00	...	......	.....	1	54	54.00
Gunsmiths	1	46	46.00	...	......	.....	1	46	46.00
Harness makers	...	......	.....	1	71	71.00	1	71	71.00
Jewelers	22	1,035	47·05	12	463	38.60	34	1,498	44.00
Manufacturers	6	433	72.16	6	402	67.00	12	835	69.60
Masons	10	631	63.10	9	561	62.30	19	1,192	62.70
Mechanics	26	1,112	42.77	16	827	51.68	42	1,939	46.16
Millers	1	81	81.00	1	71	71.00	2	151	75.50
Millwright	...	......	.....	1	75	75.00	1	75	75.00
Miners	...	......	.....	1	78	78.00	1	78	78.00
Moulders	2	83	41.50	9	395	44.00	11	478	43.45
Operatives	21	749	35.70	76	3,148	41.42	97	3,897	40.00
Overseers and Superintendents	1	37	37.00	5	252	50.40	6	289	48.16
Painters	9	365	40.55	2	179	89.50	11	544	49.45
Pattern makers	1	79	79.00	3	116	38.66	4	195	48.75
Plumbers	1	32	32.00	...	......	.....	1	32	32.00
Pork packer	1	32	32.00	...	......	.....	1	32	32.00
Printers	4	240	60.00	3	128	42.66	7	368	52.57
Roll coverer	1	.70	70.00	2	116	58.00	3	186	62.00
Sash and Blind maker	...	......	.....	1	54	54.00	1	54	54.00
Ship carpenters	1	70	70.00	1	88	88.00	2	158	79.00
Silversmiths	1	54	54.00	...	......	.....	1	54	54.00
Stone cutters	1	37	37.00	1	30	30.00	2	67	33.50
Stucco workers	2	118	59.00	...	......	.....	2	118	59.00
Tailors	5	268	53.60	15	1,070	71.33	20	1,338	66.90
Tinsmiths	3	147	49.00	2	115	57.50	5	262	52.40
Tool makers	2	140	70.00	...	......	.....	2	140	70.00
Upholsterers	1	24	24.00	...	......	.....	1	24	24.00

TABLE XI.—OCCUPATIONS, 1883.—Continued.

OCCUPATIONS.	PROVIDENCE CITY. Number of Decedents.	Aggregate Age.	Average Age.	REST OF STATE. Number of Decedents.	Aggregate Age.	Average Age.	WHOLE STATE. Number of Decedents.	Aggregate Age.	Average Age.
Watch makers	1	69	69.00	2	96	48.00	3	165	55.00
Wheelwrights......	1	148	74.00	1	76	76.00	3	224	75.00
V. FEMALES.									
House keepers	...	...	...	116	6,342	54.68	116	6.343	54.68
Cooks.............	1	67	67.00	...	...	...	1	67	67.00
Dressmakers and Seamstresses.....	5	201	40.20	5	311	62.50	10	512	51.20
Music teacher......	1	32	32.00	...	...	...	1	32	32.00
Nurses............	2	94	47.00	3	224	74.66	7	318	63.60
Operatives.........	4	109	27.25	14	462	33.00	18	571	31.72
Servants...........	10	565	56.50	18	911	50.60	28	1,476	53.00
Sisters of Mercy ...	2	95	47.50	2	125	62.50	4	220	55.00
Tailoresses.........	2	81	40.50	1	55	55.00	3	136	45.33
Teachers	1	56	56.00	3	121	40.33	4	177	44.25

Table XI.—RECAPITULATION BY CLASSES.

OCCUPATIONS.	WHOLE STATE.			PROVIDENCE CITY.			REST OF STATE.		
	Number of Decedents.	Aggregate Age.	Average Age.	Number of Decedents.	Aggregate Age.	Average Age.	Number of Decedents.	Aggregate Age.	Average Age.
I. Agriculture.	142	9,702	68.31	10	707	70.70	132	8,995	68.15
II. Profess'nal and Personal Services.....	378	18,797	49.71	203	9,961	49.07	175	8,836	50.49
III. Trade and Transportation..........	176	9,126	51.85	73	3,902	53.45	103	5,224	50.71
IV. Manufactures, Mechanical and Mining Industries.....	424	21,334	50.31	176	8,584	48.77	248	12,750	51.41
V. Females...	190	9,852	46.60	28	1,300	46.43	162	8,552	52.80
All Classes...	1,310	68,811	52.53	490	24,454	49.91	820	44,350	54.09

Table XII.—OCCUPATIONS AND CAUSES OF DEATH, 1883.

Ages under twenty being excluded.

OCCUPATIONS.	Accident.	Apoplexy and Paralysis.	Aneurism.	Asthma.	Bladder, Diseases of.	Brain, Diseases of.	Bronchitis.	Cancer.	Consumption.	Diabetes.	Enteritis.	Epilepsy.	Fevers, Typhoid, &c.	Heart, Diseases of.	Insanity.	Intemperance.	Kidneys, Diseases of.	Laryngitis.	Liver, Diseases of.	Old Age.	Pneumonia.	Rheumatism.	Spine, Diseases of.	Stomach, Diseases of.	Suicide.
I. Agriculture.																									
Farmers	6	23	...	...	1	7	2	6	13	...	8	...	6	23	...	...	4	...	1	22	16	2	...	2	...
Florists	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gardeners	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	...	...	...	...
II. Professional and Personal Services.																									
Architects	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Barbers	...	...	...	...	...	...	...	...	5	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...
Canvassers	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...
Civil Engineers	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...
Clergymen	...	4	...	...	...	...	1	...	1	...	...	...	...	...	...	...	3	...	1	...	...	...	...	...	...
Clerks and Salesmen	1	2	...	...	...	...	...	1	12	...	2	...	7	5	...	1	3	...	...	1	4	...	2	...	...
Coachmen	1	...	...	...	...	...	...	...	4	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...
Constables	1	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...
Cooks	...	1	...	...	...	...	...	2	...	...	...	...	...	3	...	...	...	...	...	...	1	...	...	...	...
Dentists	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	1	...	...	...	...
Hostlers	...	...	...	...	...	...	...	...	...	...	1	...	1	...	...	...	1	...	...	...	1	...	...	...	...
Hotel keepers	1	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Laborers	20	20	...	1	2	2	5	10	75	...	11	3	21	16	...	2	13	1	2	12	33	...	1	...	3
Lawyers	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...
Musicians	...	...	...	...	...	...	...	...	1	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...
Music teachers	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Nurses	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...

TABLE XII.—OCCUPATIONS AND CAUSES OF DEATH, 1883.—Continued.

OCCUPATIONS.	Accidents.	Apoplexy and Paralysis.	Aneurism	Asthma.	Bladder, Diseases of.	Brain, Diseases of,	Bronchitis.	Cancer.	Consumption.	Diabetes.	Enteritis.	Epilepsy.	Fevers, Typhoid, &c.	Heart. Diseases of.	Insanity.	Intemperance.	Kidneys, Diseases of.	Laryngitis.	Liver, Diseases of.	Old Age.	Pneumonia.	Rheumatism.	Spine, Diseases of.	Stomach, Diseases of.	Suicide.
Photographers													1												
Physicians		1									1			1						1					
Policemen													1	1			1								
Saloon keepers		1	1										1	1			1							2	
Stable keepers									1											2	1				
Students																									1
Teachers		1				1			3				2								1	1		1	
Telephone Operators																					1				
Waiters	1																								
Watchmen							1			1			1								1				
III. Trade and Transportation.																									
Agents (Various)	1	1						1	2					1		2					1				
Apothecaries									1					1							1				
Book keepers		2							5				1				1				1			1	
Brakemen	1																								
Brokers		1			1	1					1			1			1								1
Butchers																	1				1				
Conductors	1										1														
Expressmen	1	1				1			3							1					1				
Fishermen and Oystermen	3	1	1										1	1			1								
Grocers		2	1	2				2	3				1	2		1			2	1	1				
Hackmen									1																
Liquor dealers	1	1							2							2	1		1		1				
Mariners		1									1											1			
Marketmen																			1		1				

OCCUPATIONS.	Accidents.	Apoplexy and Paralysis.	Aneurism.	Asthma.	Bladder, Diseases of.	Brain, Diseases of.	Bronchitis.	Cancer.	Consumption.	Diabetes.	Enteritis.	Epilepsy.	Fevers, Typhoid, &c.	Heart, Diseases of.	Insanity.	Intemperance.	Kidneys, Diseases of.	Laryngitis.	Liver, Diseases of.	Old Age.	Pneumonia.	Rheumatism.	Spine, Diseases of.	Stomach, Diseases of.	Suicide.
Merchants		7	1		1			1	3	2	2	1	1	3			4			2	5			1	
Peddlers									1				1	1							1				
Porters							1													1					
Railroad Station Agents						1																			
Sea Captains		2					1	1												1	1				1
Seamen, ordinary		1										1		1		1	1			1		1			1
Ship Chandlers						1																			
Teamsters									3				3	2						1	1				
Traders and Dealers	1						2		4		1		2	1	1					1					1
IV. MANUFACTURES, MECHANICAL AND MINING INDUSTRIES.																									
Bakers		1							1													1			
Blacksmiths		3						3			2		1	1			1		2	2	1				
Bleachers																									
Block makers																									
Boat builders		1																							
Boiler makers									2										1			1			
Boot and Shoe makers		1				1	1	1	5					2		1				1	1	1			1
Brewers																					1				
Cabinet makers	1																								
Carpenters	3	6			1	2		2	12	2	2		2	9	1		4		1	4	3	1		1	
Carriage makers														1											1
Cigar makers									1																
Coopers		1							2					1											
Designers	1																								
Die sinkers																					1				
Dyers		1											1	1						1					
Engineers	2				1				3				1	1							1				

TAALE XII.—OCCUPATIONS AND CAUSES OF DEATH, 1883.—Continued.

OCCUPATIONS.	Accidents.	Apoplexy and Paralysis.	Aneurism.	Asthma.	Bladder, Diseases of.	Brain, Diseases of.	Bronchitis.	Cancer.	Consumption.	Diabetes.	Enteritis.	Epilepsy.	Fevers, Typhoid, &c.	Heart, Diseases of.	Insanity.	Intemperance.	Kidneys, Diseases of.	Laryngitis.	Liver, Diseases of.	Old Age.	Pneumonia.	Rheumatism.	Spine, Diseases of.	Stomach, Diseases of.	Suicide.
Engravers									1																
File cutters									2		1														
Gas fitters									2								1								
Glaziers														1											
Gunsmiths									1															1	
Harness makers		1																			1				
Hatters																					1				
Jewelers	1	1	1			1	1		15				4	5	2	2	1	1			1				
Manufacturers		4		1	2			1					1	1			1			1	1				
Masons		1			1		1	2	4			1		2			1			2	3				
Mechanics		3	1	1		1	1	1	15	1			2	3		1	2			1	4	2		2	1
Millers									1																1
Millwright																				1					
Miners																				1					
Moulders	1	1					1	1	3				1								1		1		
Operatives	5	5		2		2	3	2	39	1	5		9	7	2		1		3	2	12			2	2
Overseers and Superintendents		1				1			1								1				1			1	
Painters	1		1				1		3				1	2			1			1	2				
Pattern maker					1				1											1	1				
Plumbers	1																								1
Pork packer																					1				
Printers		1							1				1	1			1		1	1					
Roll Coverer		1																		1	1				
Ship carpenters									1					1						1					
Silversmiths									1																
Stair builder									1																
Stone cutters									2																
Stucco workers	1																				1				
Tailors		2		1				3	5		1			3			1			2	2				

OCCUPATIONS.	Accidents.	Apoplexy and Paralysis.	Aneurism.	Asthma.	Bladder, Diseases of.	Brain, Diseases of.	Bronchitis.	Cancer.	Consumption.	Diabetes.	Enteritis.	Epilepsy.	Fevers, Typhoid, &c.	Heart, Diseases of.	Insanity.	Intemperance.	Kidneys, Diseases of.	Laryngitis.	Liver, Diseases of.	Old Age.	Pneumonia.	Rheumatism.	Spine, Diseases of.	Stomach, Diseases of.	Suicide.
Tinsmiths									5											1					
Tool makers		1																							1
Upholsterers									1																
Watch makers								1	1				1												
Wheelwrights		1																		1	1				
V. Females.																									
Actress																									
House keepers		10		1		1	2	7	26		4	1	7	22		1	5		3	17	19		1	2	1
Book binders																									
Dressmakers and Seamstresses		3		1					4								1							1	
Nurses	1	1						1												1					1
Operatives	1	1				1			10				1							2	1	1			
Servants		1				2		1	10		1		4	1			1			4	2			1	
Tailoresses															1		1					1			
Teachers		1						1	3				1												

TABLE XII.—RECAPITULATION BY CLASSES.

OCCUPATIONS.	Whole number of given causes.	Accidents.	Apoplexy and Paralysis.	Aneurism.	Asthma.	Bladder, Diseases of.	Brain, Diseases of.	Bronchitis.	Cancer.	Consumption.	Diabetes.	Enteritis.	Epilepsy.	Fevers, Typhoid, &c.	Heart, Diseases of.	Insanity.	Intemperance.	Kidneys, Diseases of,	Laryngitis.	Liver, Diseases of.	Old Age.	Pneumonia.	Rheumatism.	Spine, Diseases of.	Stomach, Diseases of.	Suicide.
I. AGRICULTURE	145	6	24	....	....	1	7	2	6	14	....	8	....	6	23	....	....	4	....	2	22	16	2	..	2	...
II. PROFESSIONAL AND PERSONAL SERVICES	380	25	30	1	1	2	4	7	14	104	1	16	3	37	30	1	3	22	1	4	16	47	1	3	3	4
III. TRADE AND TRANSPORTATION	155	9	20	3	2	2	4	4	5	28	2	6	2	10	14	1	7	10	...	4	8	6	2	....	2	4
IV. MANUFACTURES, MECHANICAL AND MINING INDUSTRIES	422	22	36	3	5	6	8	8	17	114	4	11	1	25	44	5	5	16	1	8	25	43	....	1	7	8
V. FEMALES	201	3	17	...	2	....	4	2	10	53	....	5	1	13	23	1	1	8	....	3	24	22	2	1	4	2
TOTAL	1,303	65	127	7	10	11	27	23	52	313	7	46	7	91	134	8	16	60	2	21	95	133	7	5	18	18

RESULTS AND OBSERVATIONS, 1883.

There were recorded in the State of Rhode Island, during the year 1883, seven thousand and forty-six (7,046) births; two thousand six hundred and eleven (2,611) marriages; and five thousand two hundred and eighty-two (5,282) deaths.

TABLE XIII.

Presenting the General Results of Registration in the State, during each of the last thirty years.

Year.	Whole Number. of Births.	Still-born.	Living Births.	Marriages.	Deaths.
1854	2,105	78	2,027	1,047	1,720
1855	2,926	124	2,802	1,375	1,846
1856	2,906	183	2,723	1,535	2,042
1857	4,026	185	3,841	1,526	2,325
1858	4,263	177	4,086	1,438	2,616
1859	4,500	177	4,323	1,672	2,270
1860	4,660	167	4,493	1,748	2,686
1861	4,840	146	4,694	1,533	2,927
1862	4,125	123	4,002	1,450	2,591
1863	3,691	111	3,580	1,618	3,207
1864	3,892	138	3,754	1,844	3,360
1865	3,955	177	3,778	1,896	3,405
1866	4,902	172	4,730	2,318	2,970
1867	5,127	163	4,964	2,344	2,889
1868	5,372	212	5,160	2,285	2.912
1869	5,245	220	5,025	2,289	3,382
1870	5,215	234	4,981	2,362	3,238
1871	5,678	223	5,455	2,336	3,344
1872	6,143	202	5,941	2,537	4,247
1873	6,022	228	5,794	2,630	4,403
1874	6,466	277	6,189	2,541	4,229
1875	6,508	246	6,262	2,485	4,317
1876	6,329	224	6,105	2,253	4,116
1877	6,235	242	5,993	2,282	4,450
1878	6,714	248	6,466	2,324	4,441
1879	6,350	216	6,134	2,396	4,472
1880	6,295	192	6,103	2,769	4,829
1881	6,761	264	6,497	2,750	5,016
1882	6,825	253	6,572	2,634	5,074
1883	7,046	253	6,793	2,611	5,282

During the period of thirty years there were recorded 155,122 births, of which number 5,855 were still-born, and 149,267 were living children.

During the same period there were recorded 62,848 marriages, or 125,696 persons married, and 104,606 deaths.

On another page the usual table is given, showing a comparison of the births, marriages and deaths with the population, in each town in the State, for the year 1883.

Table XIII shows the slightly varying proportions in the number of the events of birth, marriage and death during the same year, and between different years, for a period of thirty years.

It will be noticed that the number of births in 1883 was considerably larger than the number in 1882, the number of still-born the same, the number of marriages less, and the number of decedents larger by about two hundred.

The number of still-born, in proportion to the number of living births, was less than the average of previous years, that is, one still-birth in every twenty-nine of the whole number, in 1883, as against the average of one in every twenty-six and five-tenths for the previous years.

In Table XIV may be found the number of each of the events of birth, marriage and death occurring in each of the several towns and cities in the State, during 1883, and the proportion of the number of each of the same events to the population in each of the towns, by the census of 1880.

Table XIV.

BIRTHS, MARRIAGES AND DEATHS IN RHODE ISLAND, IN 1883, COMPARED WITH THE POPULATION BY THE CENSUS OF 1880.

TOWNS AND DIVISIONS OF THE STATE.	Population in 1880.	Births in 1883.	To population one birth in	Marriages in 1883.	To population one person married in	Deaths in 1883.	Of population one death in	Deaths to each 100 of the population.
Barrington	1,359	21	64.2	10	67.9	14	96.3	1.03
Bristol	6,028	155	38.2	40	75.3	116	52.0	1.92
Warren	4,007	82	48.8	45	44.5	72	55 6	1.80
Bristol County	11,394	258	44.1	95	59.8	202	56.4	1.77
Coventry	4,519	97	46.6	23	98.2	81	55.8	1.79
East Greenwich	2,887	66	43.7	38	38.0	57	50.7	1.97
West Greenwich	1,018	22	46.3	5	101.8	11	91.8	1.08
Warwick	12,164	321	38.0	107	56.8	153	79.5	1.26
Kent County	20,588	506	40.6	173	59.5	302	68.1	1.46
Jamestown	459	5	91.8	2	114.7	4	114.7	0.87
Little Compton	1,202	11	109.2	8	75.1	23	52.3	1.90
Middletown	1,139	16	71.2	7	81.3	12	95.0	1.06
New Shoreham	1,203	32	37.6	6	100.2	20	60.1	1.66
Portsmouth	1,979	29	68.3	16	61.8	27	73.3	1.36
Tiverton	2,505	43	58.3	21	59.6	33	75.9	1.31
Towns, Newport County	8,487	136	62.4	60	70.7	119	71.3	1.40
Newport City	15,693	587	26.7	131	59.9	311	50,4	1.98
Burrillville	5,714	100	57.1	26	109.9	86	66.4	1.50
* Cranston	5,940	133	44.6	22	135.2	108	56 5	1.77
Cumberland	6,445	176	36.6	71	45.4	146	44.1	2.26
East Providence	5,056	138	36.6	53	47.7	97	53.1	1.91
Foster	1,552	25	62.0	17	45.6	31	50.1	1.99
Glocester	2,250	49	46.0	10	112.5	23	97.8	1.02
Johnston	5,765	119	48.4	33	87.3	47	122.6	0.81
Lincoln	13,765	391	35.2	115	59.8	274	52.8	1.99
North Providence	1,467	21	69.8	3	244.5	17	86.3	1.15
North Smithfield	3,088	50	61.7	22	70.2	37	83.4	1.19
Pawtucket	19,030	527	36.1	214	44.4	390	48.8	2.04
Scituate	3,810	79	48.2	37	51.5	71	53 6	1.86
Smithfield	3,085	54	57.1	24	64.3	27	110.5	0.87
Woonsocket	16,050	411	39.0	154	52.1	311	51.6	1.93
Towns, Providence County	93,017	2,273	40.9	801	58.1	1,770	52.6	1.90
Providence City	104,857	2,916	35.9	1,177	44.5	2,357	44.4	2.24
Charlestown	1,117	14	79.5	13	43.0	12	93.0	1.07
Exeter	1,310	22	59.5	17	38.5	19	68.9	1.45
Hopkinton	2,952	49	60.2	34	41.0	39	75.7	1.32
North Kingstown	3,949	82	48.1	23	85.8	41	96.3	1.03
South Kingstown	3,114	108	47.3	35	44 8	42	74.1	0.82
Richmond	1,949	23	84.7	8	121.8	20	97.4	1.02
Westerly	6,104	72	84.7	44	69.3	48	127.1	0.78
Washington County	22,495	370	60.6	174	64.6	221	101.2	0.98
Whole State	276,531	7,046	39.2	2,611	52.9	5,282	52.4	1.91

* Not including deaths in State institutions in Cranston.

BIRTHS.

It should be observed, in reference to the proportion of the number of births, marriages and deaths to the population, in the several towns, on the preceding page, in Table XIV, that the proportions are not exact in all the towns as to the population during 1883, because of changes in the number of people since 1880, in which year the last enumeration of all the towns was taken.

In a majority of the towns the population has increased since 1880, and, therefore, in those towns, the actual proportions of the events to population are less than given in Table XIV. Enumerations have been had in two of the towns since, but it seemed best to put all of the towns on the basis of the census of 1880, when they were all taken together.

The largest proportion of births to population, during 1883, occurred in the city of Newport, that is, one birth to every twenty-six and seven-tenths of the population, by the census of 1880. This is an extraordinary proportion, admitting that the population has increased since the last census. The proportion of births is nearly double that of deaths in that city, that is, 3.74 per cent. of births, as against 1.98 per cent. of deaths. The proportion of births was also largest in Newport in 1882, and in 1878.

Following Newport, in the large proportion of births to populations, are Lincoln, one birth to every 35.2 of the population; Providence city, one in every 35.9; Pawtucket, one in every 36.1 of the population.

The leading towns having the smallest proportion of births to population are, Little Compton, with one birth in every 109.8 of the population; Jamestown, one in every 91.8; Richmond and Westerly each one in every 84.7, and Charlestown, one in every 79.5 of the population.

The range of difference in the different towns, in the proportion of births to population, during 1883, was considerably less than in 1882, or the average of previous years.

The proportions of the several counties, the cities of Providence and Newport, and the towns of Providence and Newport Counties, may be easily compared as presented on the following page:

Bristol County	One birth in every 44.1 of the population.
Kent County	One birth in every 40.6 of the population.
Newport County Towns	One birth in every 62.4 of the population.
Newport City	One birth in every 26.7 of the population.
Newport County	One birth in every 33.4 of the population.
Providence County Towns	One birth in every 40.9 of the population.
Providence City	One birth in every 35.9 of the population.
Providence County	One birth in every 38.1 of the population.
Washington County	One birth in every 60.6 of the population.
Whole State	One birth in every 39.2 of the population.

MARRIAGES.

The number of persons married, in any town of small size in the State, in proportion to the population of the same, is so variable from year to year that the returns from single towns, in any one year, would be valueless for statistical purposes. But in towns of large size, and in cities, the variations from one year to another are very much less. Aggregated in counties, the returns from the towns are, however, of sufficient value to furnish reliable statistical data.

The ratio of persons married during the year 1883, to the population in each of the several counties, by the census of 1880, was as follows:

Bristol County	One person married in every 59.8 of the population.
Kent County	One person married in every 59.5 of the population.
Newport County	One person married in every 63.3 of the population.
Providence Connty	One person married in every 50.0 of the population.
Washington County	One person married in every 64.6 of the population.

For the purpose of showing the difference between the aggregates of some of the country towns and the cities of Providence and Newport, the following summary is presented:

Towns, Providence County	One person married in every 58.1 of the population.
Providence City	One person married in every 44.5 of the population.
Towns, Newport County	One person married in every 70.7 of the population.
Newport City	One person married in every 59.9 of the population.

In the whole State the proportion was one person married in every 52.9 of the population.

DEATHS.

According to the returns and the ratio to population, based on the census of 1880, the towns most prominent in the largest death rate, during 1883, are Cumberland, and Providence city.

In Providence the proportion was one death in every 44.4 of the living inhabitants; in Cumberland the still larger proportion of one death in every 44.1 of the living population. Probably by the exact number of living persons residing in those towns in the middle of the year 1883, the proportion of the city of Providence would be about one death in every 50.8 of the living population, and of Cumberland about one death in every 50.1 of the population; or 19.7 decedents in each thousand of living population in Providence, and 19.9 in each thousand in Cumberland.

Newport city also shows a large death rate, a proportion of one decedent in every 50.4 of the population, or about 19.8 decedents in each thousand of the living population.

Of the towns having a small death rate according to the returns, Westerly reports the exceedingly small proportion of one death to every 127.1 of the inhabitants, or a rate of 7.8 in each thousand of the living population, about three-quarters of one per cent.

In 1882 the proportion in Westerly, as returned, was 9 in each thousand, and in 1881 it was 6.9 in each thousand.

Very small death rates are also reported from Johnston, Smithfield and Jamestown, as may be seen in Table XIV.

The following summary will present the ratios of mortality to population in the different cities and counties of the State, during 1883, by the census of 1880:

Bristol County	17.7 in each one thousand of the population.
Kent County	14.6 in each one thousand of the population.
Towns, Newport County	14.0 in each one thousand of the population.
City of Newport	19.8 in each one thousand of the population.
Newport County	17.8 in each one thousand of the population.
Towns, Providence County	19.0 in each one thousand of the population.
City of Providence	22.4 in each one thousand of the population.
Providence County	20.8 in each one thousand of the population.
Washington County	09.8 in each one thousand of the population.
Whole State	19.1 in each one thousand of the population.

The summary below will present, in a condensed form for comparison, the proportional results of registration of the different events, in the different cities and counties, during the year 1883:

	Births. Of population one in every	Marriages. Of population one person married in every	Deaths. Of population one in every
Bristol County	44.1	59.8	56.4
Kent County	40.6	59.5	68.1
Newport Connty	33.4	63.3	56.2
Providence County	38.1	50.0	47.9
Washington County	60.6	64.6	101.2
Newport City	26.7	59.9	50 4
Providence City	35.9	44.5	44.4
Whole State	39.2	52.9	52.4

In the following Table the different events of births, marriages and deaths in the State, during the year 1883, may be readily compared with those of the preceding two years:

TABLE XV.

Births, Marriages and Deaths in Rhode Island, in each of the three years 1881, 1882 and 1883.

TOWNS AND DIVISIONS OF THE STATE.	Births in 1881.	Births in 1882.	Births in 1883.	Marriages in 1881.	Marriages in 1882.	Marriages in 1883.	Deaths in 1881.	Deaths in 1882.	Deaths in 1883.
Barrington	13	27	21	14	8	10	15	10	14
Bristol	147	143	155	51	43	40	112	107	116
Warren	79	89	82	56	38	45	77	71	72
BRISTOL COUNTY	239	259	258	121	89	95	204	188	202
Coventry	104	105	97	32	26	23	108	87	81
East Greenwich	67	58	66	49	41	38	57	51	57
West Greenwich	31	21	22	7	1	5	15	16	11
Warwick	263	270	321	102	118	107	159	161	153
KENT COUNTY	465	454	506	190	186	173	339	315	302
Jamestown	11	4	5	......	2	2	7	5	4
Little Compton	9	17	11	11	10	8	21	20	23
Middletown	24	26	16	5	8	7	15	7	12
New Shoreham	20	27	32	3	5	6	19	13	20
Portsmouth	40	25	29	9	11	16	25	35	27
Tiverton	52	63	43	24	23	21	40	39	33
TOWNS, NEWPORT COUNTY	156	162	136	52	59	69	127	119	119
NEWPORT CITY	349	501	587	117	137	131	253	297	311
Burrillville	138	118	100	44	34	26	79	78	86
* Cranston	123	128	133	25	29	22	170	209	108
Cumberland	172	149	176	62	64	71	97	136	146
East Providence	124	153	138	45	44	53	87	82	97
Foster	15	12	25	22	10	17	32	16	31
Glocester	41	46	49	20	17	10	49	22	23
Johnston	139	154	119	27	27	33	60	74	47
Lincoln	432	362	391	99	115	115	318	220	274
North Providence	29	22	21	1	2	3	11	19	17
North Smithfield	68	65	50	33	23	22	41	41	37
Pawtucket	519	457	527	236	219	214	342	350	390
Scituate	71	63	79	42	35	37	48	51	71
Smithfield	66	40	54	28	26	24	32	24	27
Woonsocket	441	457	411	176	166	154	315	344	311
TOWNS, PROVIDENCE COUNTY	2,378	2,226	2,273	860	811	801	1,681	1,666	1,707
PROVIDENCE CITY	2,803	2,788	2,916	1,202	1,172	1,177	2,145	2,242	2,357
Charlestown	13	18	14	14	7	13	11	7	12
Exeter	20	29	22	12	6	17	23	18	19
Hopkinton	62	52	49	32	29	34	56	40	39
North Kingstown	99	86	82	29	23	23	58	55	41
South Kingstown	85	111	108	40	36	35	51	57	42
Richmond	32	23	23	6	4	8	26	15	20
Westerly	60	116	72	75	75	44	42	55	48
WASHINGTON COUNTY	371	435	370	208	180	174	267	247	221
WHOLE STATE	6,761	6,825	7,046	2,750	2,634	2,611	5,016	5,074	5,282

* Exclusive of deaths in State institutions.

TABLE XVI.

Showing the proportions of Births, Marriages and Deaths to the population, in the aggregate for the whole State, in each of the last fifteen years.

YEARS.	BIRTHS.		MARRIAGES.		DEATHS.		
	Number.	To population one birth in	Number	Of population one person married in	Number.	Of population one death in	Deaths in each 100 of the population.
1869........	5,245	41.4	2,289	47.5	3,382	64.2	1.56
1870	5,215	41.7	2,362	46.0	3,238	67.1	1 49
1871......... ...	5,678	38.2	2,336	46.5	3,444	65.0	1.54
1872.......... ..	6,143	35.4	2,537	42.9	4,247	51.2	1.95
1873............	6.022	36.1	2,630	41.3	4,403	49.4	2.03
1874....	6,466	39.9	2,541	50.8	4,229	61.1	1.64
1875........	6,508	39.7	2,485	52.0	4,317	59.8	1.67
1876............	6,329	40.8	2,253	57.3	4,116	62.7	1.59
1877............	6.235	41.4	2,282	56.6	4,450	58.0	1.72
1878.......	6,714	38.5	2,324	55.7	4,441	58.1	1.72
1879	6,350	43.6	2,396	57.8	4,472	61.9	1.60
1880............	6.295	43.9	2,769	49.9	4,829	57.3	1.75
1881...........	6,761	40.9	2,750	50.3	5,016	55.1	1.81
1882	6,825	40.5	2,634	52.5	5,074	54.5	1.83
1883............	7,046	39.2	2,611	52.9	5,282	52.4	1.91

The above proportions are computed upon the basis of the last semi-decennial census, previous to the year in which the events occurred, except when they occurred in the year in which the census was taken, and in one or two instances when the reports were delayed until after taking the enumeration of the inhabitants in June.

There was a very considerably larger number of births, in 1883, than in any previous year. The proportion to population, also, as represented in the Table, would seem to indicate a considerable comparative increase over the previous four years. It is probable, however, that if the true number of the population was known, it would be found that the proportion of births in 1883 was nearer one in every 41.5 of the inhabitants, and, therefore, not really larger than in, at least, the preceding two years.

The question of the proportion of births in the State to the pop-

ulation, is of considerable interest, and has been considered to some extent in previous reports. It has been shown that the proportion has grown less during the last fifteen years.

The proportion is also less than in some other States where the returns of births are approximately complete, and where the proportion of married women between the ages of eighteen and fifty to the whole population is smaller than in Rhode Island.

It is also smaller than in Ireland, from whence large numbers of females emigrate at the beginning of the child-bearing period, and also very much smaller than in England, where the same exodus obtains, although to a much more limited extent.

In Ireland, the proportion of births to population, for a series of years, according to the report of the Register General, was 26.9 in each 1,000 persons.

In England, by the same authority, the proportion is given as 35.4 in each 1,000 persons.

In Rhode Island, the average of the last five years, which precede as well as follow a census enumeration, the proportion has been 24.1 in each 1,000 of the population.

It is doubtful if the physical capacity for child bearing has lessened in Rhode Island, or that inaptness of conception has increased to much extent, and that neither nor both, with the diminished proportion and somewhat later period of life at which marriages are now contracted, are a sufficient explanation of the fact.

It will be seen, by Table XVI, that the proportions to population of persons married have varied from year to year, the percentage having lessened during the past ten years.

During the period of five years, from 1869 to 1873 inclusive, the average proportion of persons married was 22.3 in each thousand inhabitants.

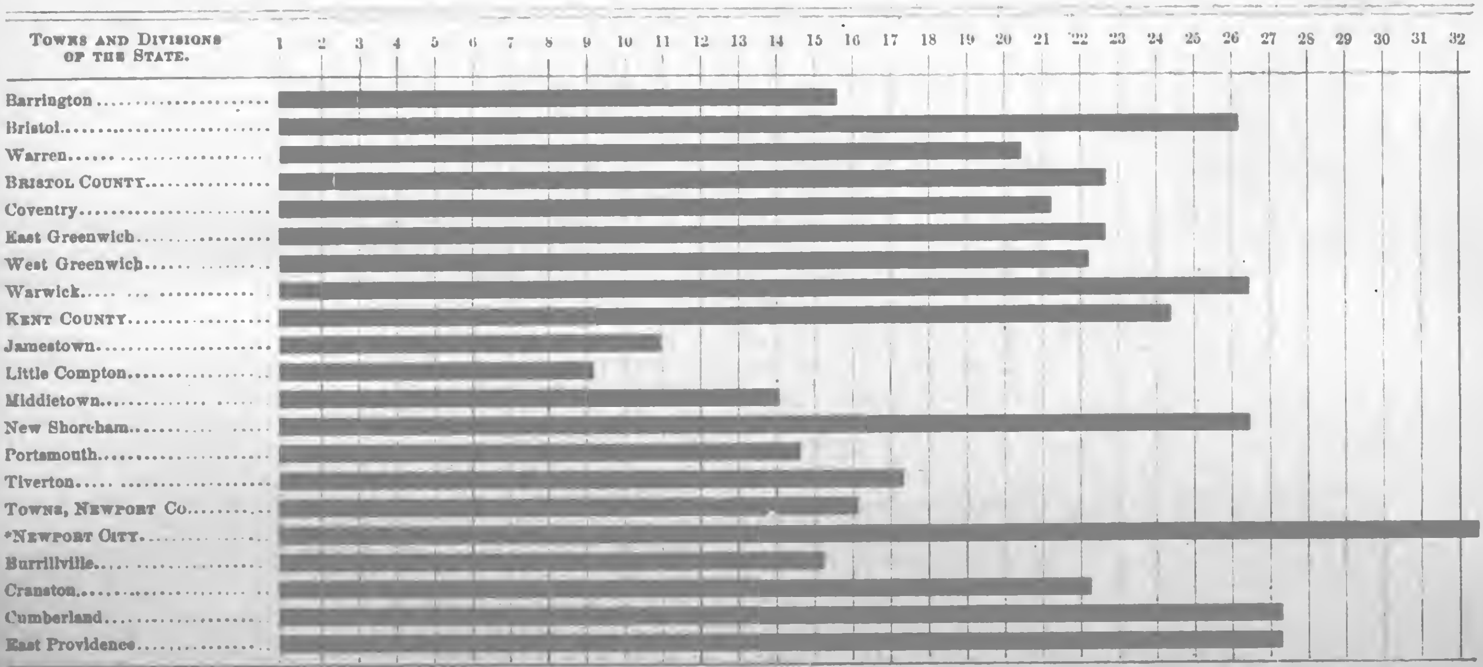
During the period of five years, from 1879 to 1883 inclusive, the proportion was 18.9 in each thousand.

It will also be seen, by the above Table, that the proportion of deaths to population has slightly increased during the last fifteen years.

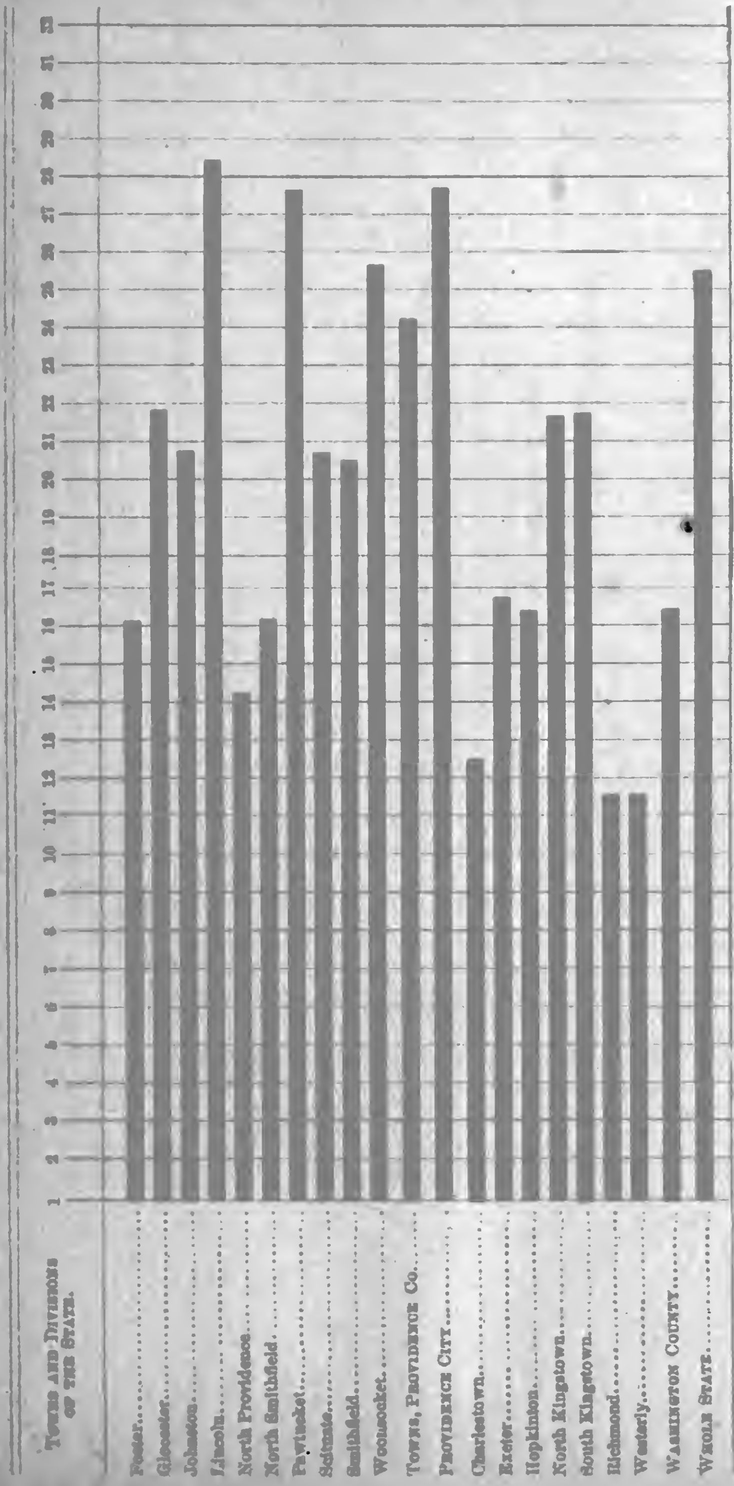
BIRTH RATES.

Diagram showing the number of births in each 1000 of the population during the year 1883, in each town and in each county in the State, by the census of 1880.

For explanation see foot note on next page.



* The proportion in the city of Newport, was the extraordinary number of 37.4 in each thousand, and too large to be fully represented in the above diagram.



The figures at the top of the perpendicular lines indicate, in whole numbers, the number of births during the year in every 1000 persons. The spaces are fractional parts of one. For instance, the heavy horizontal red line against Barrington reaches across about three-fourths of the space between the perpendicular lines 15 and 16. It shows the birth rate of Barrington, in 1868, was about fifteen and seven-tenths in each 1000 of the population.

BIRTHS, 1883.

The general statistics of births in Rhode Island, during the year 1883, derived from the returns sent to this office, may be found on pages 10 to 14 inclusive, in Tables I, II and III.

The whole number reported is 7,046, and, as before stated, is 221 more than that of 1882.

SEX OF THE CHILDREN BORN.

Of the 7,046 children whose births were reported in 1883, there were 3,548 males and 3,498 females. This gives 101.4 males to each 100 females, or 50.35 males and 49.65 females in each 100 children.

The following recapitulatory Table shows the numbers and sex, and the proportions of each sex of the children born in Rhode Island, in each of the last thirty years:

TABLE XVII.

Years.	Males.	Females.	Males to each 100 Females.	Males.		Females.	
1854	1,081	1,003	107.8, or	51.87	and	48.13	in each 100
1855	1,492	1,421	105.0, or	51.22	and	48.78	in each 100
1856	1,479	1,407	105.1, or	51.25	and	48.75	in each 100
1857	2,057	1,948	105.6, or	51.36	and	48.64	in each 100
1858	2,200	2,053	107.2, or	51.73	and	48.27	in each 100
1859	2,209	2,097	105.3, or	51.30	and	48.70	in each 100
1860	2,263	2,212	102.3, or	50 57	and	49.43	in each 100
1861	2,531	2,291	110.5, or	52.49	and	47.51	in each 100
1862	2,152	1,967	109 4, or	52 25	and	47.75	in each 100
1863	1,892	1,288	105.8, or	51.41	and	48.59	in each 100
1864	1,949	1,942	100.3, or	50 09	and	49.91	in each 100
1865	2,096	1,857	112.9, or	53 02	and	46 98	in each 100
1866	2,546	2,356	108.0, or	51.94	and	48.06	in each 100
1867	2,665	2,464	107.0, or	51.87	and	48.13	in each 100
1868	2,745	2,627	104.5, or	51.10	and	48.90	in each 100
1869	2,685	2,560	104 9, or	51.19	and	48.81	in each 100
1870	2,679	2,536	105.6, or	51.37	and	48.63	in each 100
1871	2,878	2,800	102.8, or	50.69	and	49.31	in each 100
1872	3,085	3,058	100.9, or	50.22	and	49.78	in each 100
1873	3,135	2,887	108.6, or	52.06	and	47.94	in each 100
1874	3,311	3,155	104.9, or	51.21	and	48.79	in each 100
1875	3,362	3,146	106.9, or	51.66	and	48.34	in each 100
1876	3,291	3,038	108.3, or	52.00	and	48.00	in each 100
1877	3,163	3,072	103.0, or	50.73	and	49.27	in each 100
1878	3,402	3,312	102.7, or	50.67	and	49.33	in each 100
1879	3,259	3,091	105.4, or	51.32	and	48.68	in each 100
1880	3,241	3,054	106.8, or	51.48	and	48.52	in each 100
1881	3,498	3,263	107.2, or	51.73	and	48.27	in each 100
1882	3,509	3,316	105.8, or	51.41	and	48.59	in each 100
1883	3,548	3,498	101.4, or	50.35	and	49.65	in each 100

The number of male children born, during 1883, was only 9 more than in the previous year, while the number of female children born was 182 more.

This is quite an unusual difference of increase, although in 1882 the number of male children was but eleven more than in the previous year.

PROPORTION OF THE SEXES.

The proportion of each sex to the whole number varies more or less every year, as might reasonably be expected.

In Table II, on pages 12 and 13, may be found the number of the children born in the different divisions of the State during the year, and in the several months of the year, with the number of each sex respectively.

The following Table will present, in a more concise manner, the whole number of children of each sex, and of both sexes, in each division, whose births were recorded during 1883, and also the number of males to each 100 females in the same:

TABLE XVIII.

BIRTHS, 1883.	Bristol County.	Kent County.	Newport County Towns.	Providence County Towns.	Washington County.	Newport City.	Total.	Providence City.	Whole State.
Males	125	250	64	1,156	187	292	2,074	1,474	3,548
Females	133	256	72	1,117	183	295	2,056	1,442	3,498
Total	258	506	136	2,273	370	587	4,130	2,916	7,046
Males to each 100 Females.	94.0	97.6	90.0	103.5	102.2	99.0	100.8	102.2	101.4

The quite unusual circumstance of a larger proportion of births of female children than of male children, occurred in a majority of the divisions given in Table XVIII for 1883. In not a single year during the last thirty has there been, in the whole State, as many births of female children as there were of males. But in the divisions of the State there are, in nearly every year, one or more having a preponderance of births of females, varying, however, from year to year.

The nearly equal number of births of both sexes, in 1883, is without precedent in thirty years, with two exceptions, in 1864 and 1872.

The differences of proportion of the sexes, born in the two largest divisions of population during 1883, and also the whole State, may be shown by the following contrast:

	Males.	Females.	Males to each 100 females.
Providence City	1,474	1,442	102.2
Providence County Towns	1,156	1,117	103.5
Whole State	3,548	3,498	101.4

The subject will be further considered on another page.

The following Table shows the relative proportions of the sexes, born during each of the last twenty-one years, in each of the larger divisions of the State, and in the whole State:

Table XIX.

Number of Males to each 100 Females.							
BIRTHS.	Bristol County.	Kent County.	Newport County.	Providence County Towns.	Providence City.	Washington County.	Whole State.
1863	120.0	98.4	97.0	101.8	111.4	108.7	105.8
1864	106.8	87.3	90.6	167.4	97.3	103.4	100.3
1865	119.3	118.2	108.8	118.9	113.8	88.1	112.9
1866	109.4	113.1	103.4	104.9	108.4	124.0	108.0
1867	115.5	98.3	117.8	106.3	104.5	120.4	107.7
1868	117.4	88.7	100.2	101.6	102.4	136.5	104.5
1869	115.7	116.7	102.7	98.0	107.5	120.6	104.9
1870	126.4	111.6	100.0	105.1	104.9	99.5	105.6
1871	131.8	97.9	132.5	100.8	95.2	113.3	102.8
1872	109.2	92.8	109.1	103.5	95.7	110.6	100.9
1873	129.2	113.0	117.9	104.5	109.0	104.7	108.6
1874	98.7	111.9	101.3	110.4	102.9	94.0	104.9
1875	95.2	103.1	97.7	104.3	109.1	134.3	106.9
1876	142.1	104.4	108.5	108.0	106.8	103.7	108.3
1877	138.7	102.4	98.5	100.3	104.9	95.3	103.0
1878	120.5	120.6	94.8	101.5	106.8	78.8	102.7
1879	124.3	95.5	103.6	105.4	105.7	106.3	105.4
1880	117.2	110.5	113.0	102.4	107.6	95.4	106.1
1881	91.2	111.3	102 0	105.9	109.0	115.7	107.2
1882	94.7	110.2	112.5	103.1	106.5	105.7	105.8
1883	94.0	97.6	97.0	103.5	102.2	102.2	101.4

It may be of interest to see what has been the average annual proportion of the sexes born, during the last twenty-one years, in each of

the different divisions of the State, or, in other words, the proportion of the aggregate of births of each sex, in each division, during the period of twenty-one years.

The following summary will show the number of males to each 100 females, born during the twenty-one years from 1863 to 1883 inclusive, in the different divisions of the State:

Bristol County	115.1 males to each 100 females.
Kent County	104.9 males to each 100 females.
Newport County	105.1 males to each 100 females.
Providence County Towns	104.6 males to each 100 females.
Providence City	105.3 males to each 100 females.
Washington County	107.7 males to each 100 females.
Whole State	105.3 males to each 100 females.

BIRTHS AND SEASON.

In Table II, on pages 12 and 13 of this report, may be found the whole number of births as they occurred in the different months, and in the different divisions of the State, during 1883.

An examination of that Table will show that the largest number of births, in any one month, was in the month of August, and the largest number, in any quarter of the year, was in the third quarter.

This circumstance is not in accordance with the rule of thirty years of registration. The last quarter has almost invariably given the largest number of births, and August has seldom shown as large a number of births as the later months in the year.

The following Table shows the total number of children born in the State of Rhode Island, according to the returns, in each quarter of each of the last six years; and also the aggregate number and the percentage of the aggregate in each quarter of the last twenty-nine years, from 1854 to 1882 inclusive:

TABLE XX.

QUARTERS.	1883.	1882.	1881.	1880.	1879.	1878.	1854 to 1882.	
							Number.	Per cent.
January—March	1,641	1,616	1,534	1,521	1,465	1,622	35,073	23.75
April—June	1,668	1,622	1,661	1,483	1,556	1,565	34,881	23.55
July—September	1,893	1,711	1,746	1,640	1,653	1,731	38,696	26.13
October—December	1,844	1,876	1,820	1,651	1,676	1,796	39,426	26.67
Whole year	7,046	6,825	6,761	6,295	6,350	6,714	148,076	100.00

An examination of the above Table will show that, in a period of twenty-nine years, the average percentage of the aggregate of births, during the last three months of each year, was about three per cent. larger than during either the first or the second three months of each year, and that the average of the third three months or quarter of the year was about two and one-half per cent. larger than either the first or second quarters.

The following summary will show the percentages of births in the whole State of the different quarters and of each half of the year 1883 :

January—March	23.3 per cent. of whole number.	First half.........46.9 per cent.
April—June	23.6 per cent. of whole number.	
July—September	26.9 per cent. of whole number.	Second half.......53.1 per cent.
October—December	26.2 per cent. of whole number.	
	100.0	100.0

It will be seen, by the above Table, that the percentage of births, in the first and second quarters of 1883, did not greatly differ from the average of twenty-nine years, but that the third quarter was larger and the fourth quarter smaller than the average of the long period.

BIRTHS: SEX AND SEASON.

In Table II, on pages 12 and 13, will also be found the number of births, by months, as they occurred in the different divisions of the State during the year 1883, arranged by the sexes. From it we ascertain the number of each of the sexes born during each quarter of the year, with their relative proportions; and also the aggregates and proportions of the same for the whole State.

The following Table will present a summary of the quarterly periods, number of births and proportions of the sexes, for the same :

	Males.	Females.	Males to each 100 Females.	Males.	Females.	
1. January—March	815	826	98.6, or	49.66 and	50.34	in each 100
2. April—June	829	839	98.7, or	49.70 and	50.30	in each 100
3. July—September	981	912	107.5, or	51.83 and	48.17	in each 100
4. October—December	923	921	100.2, or	50.00 and	50.00	in each 100
Whole year, 1883	3,548	3,498	101·4, or	50.03 and	49.97	in each 100

By the above summary it will be seen that, during the first half of the year 1883, the number of female children born exceeded that of

male children, and that during the last half there was an excess of male children born. The fact, however, has no particular significance, as it is a casual circumstance and will seldom recur.

The following Table shows the number of male children born to each 100 female children, in each quarter of the last five years, and also the proportion of births of male children to each 100 female children born, during three periods of five years each, from 1866 to 1880 inclusive:

TABLE XXI.

YEARS.	1883.	1882.	1881.	1880.	1879.	5 years. 1876–1880.	5 years. 1871–1875.	5 years. 1866–1870.
1st Quarter	98.6	105.6	113.4	109.7	104.6	106.9	101.5	106.7
2d Quarter	98.7	106.1	100.6	98.2	104.2	102.7	104.7	107.3
3d Quarter	107.5	107.4	107.8	103.4	101.6	107.1	104.8	106.0
4th Quarter	100.2	104.4	106.6	113.0	111.4	108.2	106.5	104.8
Total average	101.4	105.8	107.2	106.1	105.4	106.2	104.2	106.2

By the foregoing Table and summary it would appear that season has but very little influence in the causation of sex, or of any considerable difference in the number of births of either sex.

The following summary will show the proportions of the sexes born in the State in each quarter of the year, in the aggregate of a period of twenty years:

	Males to each 100 Females.		Males.		Females.	
1. January—March	105.8,	or	51.41	and	48.59	in each 100 births.
2. April—June	106.4,	or	51.55	and	48.45	in each 100 births.
3. July—September	104.3,	or	50.85	and	49.15	in each 100 births.
4. October—December	106.4,	or	51.55	and	48.45	in each 100 births.
Whole Number 20 years	105.6,	or	51.37	and	48.63	in each 100 births.

PARENTAGE.

By reference to Table I, page 10, in the division of births, there will be found the parentage of the children born in Rhode Island during the year 1883. It will be seen that of the whole number—7,046—there were 2,944 of American parentage, 2,930 foreign, and 1,172 of mixed parentage.

The following Table will show the number and parentage of the children born in the State, and the variations of the same from year to year, in each of the last five years; and also the number and variations occurring in five periods of five years each, from 1858 to 1882 inclusive:

TABLE XXII.

PARENTAGE.	1883.	1882.	1881.	1880.	1879.	5 years. 1878 to 1882.	5 years. 1873 to 1877.	5 years. 1868 to 1872.	5 years. 1863 to 1867.	5 years. 1858 to 1862.
Amer. fath. and mo..	2,944	2,915	2,859	2,741	2,767	14,169	13,431	12,214	9,712	10,609
Foreign fath. and mo.	2,930	2,788	2,798	2,555	2,573	13,562	13,990	12,366	9,968	9,697
Amer. fath. For. mo.	575	512	493	417	442	2,327	1,782	1,353	876	814
For. fath. Amer. mo.	597	610	611	582	568	2,887	2,357	1,720	941	755
Parentage not stated.	......	......	......	......	......	....	......	....	70	223
Total................	7,046	6,825	6,761	6.295	6,350	32,945	31,560	27,653	21,567	22,098

The following Table of *percentages* may be preferred, as showing in a different, and perhaps clearer way, the changes that have occurred in the proportions of the births in the different classes of parentage during the last five years, and during twenty-five years, from 1858 to 1882 inclusive, in five equal periods:

TABLE XXIII.

PARENTAGE.	1883.	1882.	1881.	1880.	1879.	5 years. 1878 to 1882.	5 years. 1873 to 1877.	5 years. 1868 to 1872.	5 years. 1863 to 1867.	5 years. 1858 to 1862.
Amer. fath. and mo..	41.78	42.71	42.29	43.55	43.57	43.03	42.55	44.17	45.18	48.50
Foreign fath. and mo.	41.58	40.85	41.38	40.60	40.53	41.23	44.35	44.72	46.37	44.33
Amer. fath., For. mo.	8.16	7.50	7.29	6.62	6.96	6.95	5.84	4.89	4.07	3.72
For. fath., Amer. mo.	8.48	8.94	9.04	9 23	8.94	8.79	7.26	6.22	4.38	3.45
Total................	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

The vital movements in the two general classes of population in Rhode Island, that is, of foreign born and native American born, and also the intermixture by marriage in the two classes, during a period of twenty-six years, are shown in the two preceding Tables.

In addition to Tables XXII and XXIII, the following Table will show the percentages of children born of American and of foreign

fathers, and of American and foreign mothers, in each of the last five years, and in each of five periods of five years each, from 1858 to 1882 inclusive:

TABLE XXIV.

CHILDREN WITH	1883.	1882.	1881.	1880.	1879.	5 years. 1878 to 1882.	5 years. 1873 to 1877.	5 years. 1868 to 1872.	5 years. 1863 to 1867.	5 years. 1858 to 1862.
American fathers	49.94	50.21	49.58	50.17	50.53	50.08	48.40	49.06	49.25	52.22
Foreign fathers.....	50.06	49.79	50.42	49.83	49.47	49.92	51.60	50.94	50.75	47.78
American mothers...	50.26	51 65	51.33	52.78	52.51	51.79	49.80	50.39	49.56	51.95
Foreign mothers.....	49.74	48.35	48.67	47.22	49.49	48.21	50.20	49.61	50.44	48.05

The subjects of birth rate to whole population, and of birth rate to population by parentage, are of considerable interest, and were presented at greater length in the Twenty-ninth Report, on pages seventy to seventy-four. Before another report will be prepared, a census of the population of Rhode Island will be taken, and the present population by classes will be more accurately known, and then more extended and accurate percentages of births to population by classes can be made.

BIRTHS OF COLORED CHILDREN.

The number of births of children of colored parentage reported for the year 1883 is 197. They are always included in the general statistics of births, but having some special importance as to the survival of the race, and other questions, they have had a separate consideration. The number is larger by 18 than that of 1882.

In regard to sex, the numbers and proportions were as follows, viz.: Males, 100; females, 97; or 50.76 males to 49.24 females in every 100 births; or 103.1 males to each 100 females.

The towns reporting colored births in 1883, and the number in each, are as follows:

TABLE XXV.

Showing Number, Sex, &c., of Colored Births, 1883.

TOWNS AND CITIES.	Whole Number.	Males.	Females.	COUNTIES.
Bristol	4	1	3	Bristol County......... 4
Coventry	1	....	1	
East Greenwich	4	4	....	
Warwick	3	....	3	Kent County......... 8
New Shoreham	1	1		
Newport City	50	23	27	Newport County...... 51
Cranston	2	1	1	
East Providence	4	2	2	
Johnston	1	1	....	
Pawtucket	2	1	1	
Scituate	1	1	....	
Providence City	112	61	51	Providence County..... 122
Exeter	1	1	....	
Hopkinton	1	1	....	
North Kingstown	1	....	1	
South Kingstown	7	2	5	
Westerly	2	....	2	Washington County.... 12
Total	197	100	97	197

The following summary will show the changes that have occurred from year to year, in the proportions of the sexes of colored children born in Rhode Island, during the last eight years:

Years.	Whole Number.	Males.	Females.	
1876	171	64	107	or 59.8 males to each 100 females.
1877	168	86	82	or 104.8 males to each 100 females.
1878	172	79	93	or 85.0 males to each 100 females.
1879	159	84	75	or 113.5 males to each 100 females.
1880	140	75	65	or 115.4 males to each 100 females.
1881	192	101	91	or 111.0 males to each 100 females.
1882	179	76	103	or 73.7 males to each 100 females.
1883	197	100	97	or 103.1 males to each 100 females.

NUMBER OF CHILD OF THE MOTHER.

The following Table shows the number of the child of the mother; that is, how many of the children born were reported as the first, second, or third child, etc., of their respective mothers. The statistics on this subject begin with the year 1857, and the following Table includes the children reported in 1881, 1882 and 1883, and also the total for twenty-five years, 1857 to 1881 inclusive:

TABLE XXVI.

NUMBER OF THE CHILD OF THE MOTHER.	1881.	1882.	1883.	25 years. 1857–1881.
First	1,552	1,704	1,764	31,735
Second	1,306	1,189	1,365	26,110
Third	1,021	989	1,026	20,468
Fourth	816	805	822	15,423
Fifth	632	628	614	11,491
Sixth	464	481	443	8,330
Seventh	334	365	343	5,837
Eighth	248	245	245	3,996
Ninth	146	171	169	2,624
Tenth	99	93	106	1,711
Eleventh	51	56	64	984
Twelfth	41	50	37	602
Thirteenth	23	30	23	308
Fourteenth	6	12	9	151
Fifteenth	11	2	7	91
Sixteenth	7	4	2	49
Seventeenth	3	0	6	29
Eighteenth	1	1	1	8
Nineteenth	0	0	0	5
Twentieth	0	0	0	3
Twenty-first	0	0	0	3
Twenty-second	0	0	0	2
Total	6,761	6,825	7,046	129,960

The whole number of births, in 1883, was about three and one-fourth per cent. greater than the whole number of 1882. From the above Table it will be seen that the increase was not uniform, or equal, in the different classes of number of child of the mother, where there

was an increase, and that in some of the classes there was a very decided decrease. The increase was approximately equal in the first, second and fourth classes, less equal in the increase of the third class, and in the fifth, sixth, seventh, twelfth, thirteenth, fourteenth and sixteenth classes the decrease is very considerable. The same facts are true of other years.

An examination of Table XXVI will show that there has been an increase, larger in proportion than the increase of population, of those mothers who have borne more than twelve children. In the class of twelfth child the average of the last three years is 43, while the average of twenty-five years, including 1881, was 24. The same will be found to be true of the classes from the twelfth to the eighteenth.

The proportion of each class to the whole number will be shown by the following Table, which gives the percentage of the children born in each of the last six years, who were respectively the first, second, third, etc., children of the mothers, and which will also give the average percentage of each class of births, during a period of ten years, from 1868 to 1877 inclusive, and of five years, 1878 to 1882 inclusive:

TABLE XXVII.

NUMBER OF THE CHILD.	1883.	1882.	1881.	1880.	1879.	1878.	5 years, 1878 to 1882.	10 years. 1868 to 1877.
First	25.03	24.96	22.92	23.50	22.59	21.77	23.1	25.2
Second	19.37	17.42	19.31	17.84	18.80	20.26	18.7	20.7
Third	14.56	14.50	15.10	16.11	15.87	18.90	16.9	15.5
Fourth	11.66	11.80	12.07	12.24	12.74	12.32	12.2	11.4
Fifth	8.71	9.17	9.35	9.23	9.33	8.77	9.1	8.4
First to Fifth	79.33	77.85	78.75	78.92	79.33	82.02	80.0	81.1
Sixth and over	20.67	22.15	21.25	21.08	20.67	17.98	20.0	18.9
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

A study of Table XXVII will be of interest, as showing the changes that take place, from year to year, in the proportions of the number of children born in each class of mothers, and also the difference of single years with periods of five and ten years.

PLURALITY BIRTHS.

The general statistics in relation to plural births, in Rhode Island, may be found on page 14, in Table III.

There were sixty-nine cases during the year, all of which were twins, or one hundred and thirty-eight children.

Of the 138 children of plural births, 61 were males, and 77 females.

The cases occurred in the different divisions of the State as follows: Kent county, 8; Newport county towns, 2; Newport city, 10; Providence county towns, 18; Providence city, 29; Washington county, 2. Bristol county made no return of a case of plural birth.

The following exhibit will show the parentage of children of plurality birth in Rhode Island in 1883, and number of each:

Parents, Native American, or born in the United States	52
Born in Ireland	16
" " France	12
" " England	10
" " Scotland	2
" " Germany	2
" " Sweden	4
American father and German mother	2
American father and Irish mother	6
American father and English mother	6
American father and Swedish mother	2
Scotch father and Irish mother	2
Scotch father and English mother	2
Irish father and American mother	10
Irish father and English mother	2
Irish father and Scotch mother	2
English father and Scotch mother	2
English father and Nova Scotia mother	2
French father and American mother	2
Total	138

The months in which the plurality births occurred were as follows:

January 8	April 10	July 6	October 12
February 6	May 18	August 14	November 4
March 10	June 20	September 20	December 10
First Quarter 24	Second Quarter 48	Third Quarter 40	Fourth Quarter 26

First half of year 72 | Second half of year 66

Total 138

The general statistics of births, and number of cases reported in Rhode Island during a period of thirty years, that is, from 1854 to 1883 inclusive, are as follows:

151,847 cases of single births	giving	151,847 children.
1,609 cases of twin births	giving	3,218 children.
19 cases of triple births	giving	57 children.
153,475 cases of child birth	giving	155,122 children.

Of the whole number of cases of child-birth (153,475) during the thirty years, one in 95.4 produced twins, and one in 8,078 produced triplets.

Of the whole number of children born, during the same period (155,122), ascertained from the reports, one in every 48.2 was a twin, and one in every 2,721 was a triplet.

Of the 1,628 cases of plurality births which have occurred in the State during the last thirty years, there were 704 cases in which both parents were Americans; 772 cases in which both parents were foreign; 144 cases in which the parentage was mixed, that is, one American and one foreign parent; and 8 in which the parentage was not stated.

The whole number of children born in plurality cases, during the thirty years, was 3,275, of whom 1,646 were males, and 1,625 were females; the sex of the remaining four was not given.

STILL-BORN.

The whole number of still-born children reported in Rhode Island, for the year 1883, was 253; this number, the same as in 1882, is 11 less than for the year 1881, and 61 more than for 1880.

The following are the numbers reported from the different divisions of the State:

Bristol County	6	Providence County Towns	71
Kent County	8	Providence City	131
Newport Connty Towns	6	Washington County	7
Newport City	24	Whole State	253

The following Table will give the number in each town from which still-births were reported:

Table XXVIII.

Still-Born in 1883. Number, Sex, Parentage and Color.

TOWNS.	Whole Number.	Males.	Females.	Americ'n.	Foreign.	White.	Colored.
Bristol	6	3	3	4	2	6	....
Coventry	2	....	2	2	....	2	....
East Greenwich	1	....	1	1	....	1	....
West Greenwich	2	2	....	2	....	2	....
Warwick	3	2	1	2	1	3	....
Little Compton	1	1	....	1	....	1	....
Middletown	1	....	1	1	....	1	....
New Shoreham	3	2	1	3	....	3	....
Portsmouth	1	1	....	1	....	1	....
Newport City	24	12	12	18	6	18	6
Burrillville	3	3	....	1	2	3	....
Cranston	2	1	1	2	....	2	....
Cumberland	5	2	3	3	2	5	....
East Providence	3	2	1	2	1	3	....
Foster	2	2	....	2	....	2	....
Gloucester	1	....	1	1	....	1	....
Johnston	1	....	1	....	1	1	....
Lincoln	13	6	7	8	5	13	....
North Smithfield	1	1	....	1	....	1	....
Pawtucket	21	10	11	9	12	21	....
Scituate	3	1	2	3	....	3	....
Woonsocket	16	9	7	3	13	16	....
Providence City	131	68	63	61	70	123	8
North Kingstown	4	4	....	3	1	4	....
South Kingstown	2	....	2	2	....	2	....
Westerly	1	....	1	....	1	1	....
Whole State	253	132	121	136	117	239	14

Sex.—Of the 253 still-born children, in 1883, 132 were males, and 121 were females.

It is a very unusual occurrence for the number of each of the sexes of still-born children to be so nearly equal, if indeed it ever happened before.

During a period of about thirty years, as may be seen in Table XXIX, the proportions averaged about 60 males and 40 females in every 100 births.

Parentage.—Of the 253 still-born children, reported in 1883, 136 were of American parentage, and 117 of foreign. The parentage is recorded by the nativity of the fathers.

Color.—The number of colored still-born was 14, as against 7 in 1882.

Season.—The number of still-born children reported in each of the several months of 1883 was as follows:

January	22	May	19	September	25
February	24	June	25	October	22
March	17	July	23	November	15
April	24	August	22	December	15
Total	253				

SUMMARY OF STILL-BORN.

The following Table shows the number and sex of the still-born children whose births were reported in Rhode Island, during each of the last six years, and also of a period extending from January 1, 1854, to December 31, 1883:

TABLE XXIX.

SEX.	1883.	1882.	1881.	1880.	1879.	1878.	January 1, 1854. to. Dec. 31, 1883.
Males	132	138	169	123	124	149	3,497
Females	121	115	95	69	92	99	2,458
Total	253	253	264	192	216	248	5,955

It will be seen that the whole number of still-births reported in the State since January 1, 1854, is 5,955. Of the sex of this number, there were 3,497 males, and 2,450 females. The ratio of occurrence, in regard to sex, would therefore be as follows: In each 100 children there were about 60 males, and 40 females; or for every 100 females there were nearly 150 males.

It will be seen that the proportion for the year 1883 varies largely from the average of a period of thirty years. The proportions standing at 110 males to each 100 females; or about 52 males and 48 females in each 100.

Season of Still-Births.—The following summary will show the number of still-births that have been reported, in Rhode Island, during a period of thirty years, from 1854 to 1883 inclusive, with the months and quarters in which they occurred:

STILL-BORN—THIRTY YEARS, 1854-1883. SEASON.

January	526	April	456	July	505	October	456
February	501	May	459	August	616	November	493
March	461	June	444	September	493	December	545
1st Quarter	1,488	2d Quarter	1,359	3d Quarter	1,614	4th Quarter	1,494

First six months, 2,847; Second six months, 3,108; Total, 5,955.

Taking the quarterly periods, it will be seen that the occurrence of still-births, in the order of from the smallest to the largest number, has been as follows: 1st, Second quarter; 2d, First quarter; 3d, Fourth quarter; 4th, Third quarter. In accordance with the general birth rate, the last half of the year has considerably the largest proportion.

PARENTAGE OF THE STILL-BORN.

Of the 253 still-born children reported in 1883, there were 136 of American, and 117 of foreign parentage, reckoned by the nativity of the fathers; and 129 of American and 124 of foreign, reckoned by the nativity of the mothers.

To show the changes that have occurred from year to year, in the percentages of parentage of *the still-born*, reckoning by the parentage of the mother, in contrast with the percentages of the same nativities to the *whole number of births*, reckoned by the parentage of the father, the following resumé, for various years and periods of years, is presented:

Years.	Of Whole Number Births. American. and Foreign.		Of Whole Number Still-Born. American. and Foreign.	
1871	49.36 and 50.64	in each 100	41.00 and 59.00	in each 100.
1872	47.59 and 52.41	in each 100	41.25 and 58.75	in each 100.
1873	50.30 and 49.70	in each 100	59.21 and 40.79	in each 100.
1874	47.14 and 52.86	in each 100	50.00 and 50.00	in each 100.
1875	47.88 and 52.12	in each 100	49.19 and 50.81	in each 100.
1876	46.43 and 53.57	in each 100	45.76 and 54.24	in each 100.
1877	49.41 and 50.59	in each 100	53.31 and 46.69	in each 100.
1878	49.35 and 50.65	in each 100	55.65 and 44 35	in each 100.
1879	50.53 and 49.47	in each 100	54.63 and 45.37	in each 100.
1880	50.17 and 49.83	in each 100	54.16 and 45.84	in each 100.
1881	49.60 and 50.40	in each 100	48.10 and 51.90	in each 100.
1882	50.21 and 49.79	in each 100	50.58 and 49.42	in each 100.
1883	49.94 and 50.06	in each 100	50.98 and 49.02	in each 100.
14 years—1859-1872	50.54 and 49.46	in each 100	41.25 and 58.75	in each 100.
10 years—1873-1882	49.10 and 50.90	in each 100	51.84 and 48.16	in each 100.

ILLEGITIMATES.

The following table will give the number, sex, color and parentage of the illegitimate children born in Rhode Island, in 1883:

TABLE XXX.

TOWNS.	Whole Number.	SEX.		COLOR.		PARENTAGE.		Almshouses or Penal Institutions.
		Males.	Females.	Black.	White.	American.	Foreign.	
Warren	1	1	......	......	1	1	......	......
Coventry	2	1	1	......	2	2	......	......
East Greenwich	1	1	......	1	......	1	......	......
Warwick	3	1	2	......	3	2	1	......
Little Compton	1	1	......	......	1	1	......	......
New Shoreham	1	......	1	......	1	1	......	......
Tiverton	1	......	1	......	1	1	......	......
Newport City	6	5	1	4	2	6	......	......
Burrillville	1	1	......	......	1	1	......	......
Cranston, State Almshouse	14	6	8	1	13	5	9	14
Woonsocket	1	1	......	......	1	......	1	......
Providence City	17	7	10	8	9	14	3	4
Exeter	1	1	......	1	......	1	......	......
Whole State	50	26	24	15	35	36	14	18

Sex.—Of the 50 children born out of the marriage state in Rhode Island, during 1883, 26 were males, and 24 were females.

The proportions were 108.3 males to each 100 females; or 52 males and 48 females in each 100 children.

Color.—The same remarkable disproportion of births of colored illegitimate children occurred, during 1883, as in the previous year.

There are in the State about 42 whites to each colored person, including all shades of race color. The proportion of the colored population is less than two and one-half per cent. of the whole population, while the proportion of colored illegitimate children, born in 1883, is thirty per cent.

Parentage.—Of the 50 illegitimates in 1883, 35 were born of American mothers, and 15 of foreign born mothers. The colored illegiti-

mates, with one exception, were of American parentage. There were of the 35 white illegitimates, 21 born of American mothers, and 14 of foreign born mothers.

The parentage given is of native born and foreign born, that is, mothers born in the United States of foreign born parents are reckoned as of American parentage. Several of the illegitimates, classed as of American parentage, are the grandchildren of foreign born grand parents.

Eighteen, or more than one-third of the illegitimates, were born of pauper or criminal mothers, in public, charitable or penal institutions.

MARRIAGES, 1883.

The number of marriages reported in Rhode Island during the year 1883 was 2,611. This number is 23 less than in 1882, and 139 less than in 1881.

The general statistics of marriage in 1883, in relation to season and number in the different divisions of the State, may be found in Table IV, on the fifteenth page.

SEASON.

The following Table will show the number and percentage of marriages in Rhode Island, in each quarter of the year 1883, together with the aggregate number and percentage in each quarter for thirty years, viz., from 1854 to 1883 inclusive:

TABLE XXXI.

YEARS.		First Quarter.	Second Quarter.	Third Quarter.	Fourth Quarter.	Whole Year.
1883	Number	535	695	587	794	2,611
	Percentage	20.49	26.58	22.46	30.47	100.00
30 yrs. 1854-1883	Number	13,996	15,646	14,651	18,555	62,848
	Percentage	22.27	24.89	23.32	29.52	100.00

The proportions to the whole number of marriages, of the marriages in the several quarters of the year, varied somewhat, in 1883, from the average of thirty years.

The proportions were larger in the first, second and fourth quarters, and smaller in the third.

In the general proportions, however, the order followed the rule established by thirty years of registration, that is, the largest number of marriages were solemnized during the last quarter, the next largest number during the second quarter, followed in that order by the third, and lastly by the first quarter.

NATIVITY OF PERSONS MARRIED.

The following Table shows the *number* of marriages, according to the nativity of the parties, for each of the last six years, and also for the aggregate of five years, from 1878 to 1882 inclusive, and of twenty years, from 1858 to 1877 inclusive:

TABLE XXXII.

BIRTH-PLACE.	1883.	1882.	1881.	1880.	1879.	1878.	5 years, 1878–1882. Total.	20 years, 1858–1877. Total.
United States	1,428	1,500	1,638	1,775	1,511	1,455	7,879	25,674
Foreign countries	709	659	623	548	467	493	2,790	10,963
American groom, foreign bride	237	242	244	202	209	181	1,078	2,410
Foreign groom, American bride	237	233	245	244	209	195	1,126	2,750
Not stated	....	.....	.....	.....	.....	.....	....	64
Total	2,611	2,634	2,750	2,769	2,396	2,324	12,873	41,861

The number of marriages of parties of whom both groom and bride were of American birth was considerably less, in 1883, than in any one of the previous five years. The number was 72 less than in 1882, 210 less than in 1881, and 347 less than in 1880.

And yet the number includes all of American birth whose parents were of foreign birth. And, notwithstanding the increase of persons of American birth, of both American and foreign parentage, the number of marriages of parties of whom both are of foreign birth has increased, from year to year, as may be seen by Table XXXII.

It will be observed that the number of marriages of parties of whom one was of American and the other of foreign birth has not varied much, during the last three years.

In the following Table are given the *percentages* of American, foreign and mixed marriages, in each of the last six years, and in the aggregate of five years, 1878 to 1882 inclusive, and of twenty years, 1858 to 1877 inclusive:

TABLE XXXIII.

BIRTH-PLACE.	1883.	1882.	1881.	1880.	1879.	1878.	5 years, 1878–1882.	20 years, Total.
United States	54.69	56.95	59.56	64.10	63.06	62.60	61.25	61.33
Foreign countries	27.15	25.02	22.65	19.79	19.49	21.22	21.63	26.19
Mixed	18.16	18.03	17.79	16.11	17.45	16.18	17.12	12.48
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

The difference between the percentage of persons married, in 1883, of whom both parties were of American birth, and the percentage of the same class during each of the previous five years, and also of each of the periods of five and of twenty years, as shown in the above Table, is significant of a considerable change of sentiment, in at least one class, in regard to the contraction of marriage.

AGES OF PERSONS MARRIED.

The number of persons married in Rhode Island, during the year 1883, in the different periods of life, is shown in Table V, on page sixteen. The number of each sex, in each division of age, can also be found in the following Table:

TABLE XXXIV.

1883.	Under 20.	20 to 25.	25 to 30.	30 to 35.	35 to 40.	40 to 45.	45 to 50.	50 to 55.	55 to 60.	60 to 65.	65 to 70.	70 to 75.	75 to 80.	80 to 85.	85 to 90.	Not stated.
Males	77	946	829	280	184	113	72	55	22	15	12	3	2	1	....	....
Females	420	1,162	541	206	135	70	43	18	9	5	2	....	....	....	....	....
Total	497	2,108	1,370	486	319	183	115	73	31	20	14	3	2	1	....	....

Capriciousness of purpose, or sentiment, or some "valuable consideration," causes a repetition from year to year of marriage between persons whose ages greatly differ. During 1883, however, the number of such marriages was less than in some previous years.

The whole number of persons, in each division of ages of both sexes, married in Rhode Island, in each of the last eighteen years, that is, from 1866 to 1883 inclusive, is presented in the following Table:

Table XXXV.

YEARS.	Under 20.	20 to 25.	25 to 30.	30 to 35.	35 to 40.	40 to 45.	45 to 50.	50 to 55.	55 to 60.	60 to 65.	65 to 70.	70 to 75.	75 to 80.	80 to 85.	85 to 90.	Not stated.
1866	693	1,931	1,025	419	213	127	81	59	25	21	12	7	....	....	....	23
1867	696	1,886	1,104	416	211	148	91	48	37	18	18	5	3	1	....	6
1868	644	1,835	1,050	432	219	133	82	61	30	29	11	8	4	....	....	32
1869	642	1,814	1,051	468	227	134	79	46	35	15	11	2	3	2	....	49
1870	744	1,883	1,084	415	216	159	86	64	26	24	12	3	2	....	....	6
1871	697	1,914	1,118	392	228	115	73	56	35	22	6	7	3	....	....	6
1872	786	2,073	1,182	434	237	131	81	61	43	21	13	6	1	....	....	5
1873	762	2,177	1,156	507	253	140	87	68	35	24	12	6	6	....	....	27
1874	770	1,992	1,179	459	268	159	101	52	36	39	8	9	1	....	....	9
1875	681	2,058	1,108	475	252	150	101	60	32	29	13	4	1	....	....	6
1876	691	1,741	1,041	450	224	154	80	53	27	19	12	3	2	....	....	9
1877	631	1,745	1,118	459	244	125	92	52	46	14	15	11	2	1	....	9
1878	618	1,832	1,123	441	259	162	74	49	39	20	17	2	4	....	....	8
1879	639	1,879	1,156	481	272	123	78	56	39	26	18	9	2	2	1	11
1880	688	2,301	1,262	556	329	163	91	65	33	27	15	3	3	1	....	1
1881	599	2,208	1,410	547	298	187	107	54	34	31	16	5	1	1	...	2
1882	498	2,125	1,377	563	301	161	102	57	36	27	11	5	3	2	...	....
1883	497	2,108	1,370	486	319	183	115	73	31	20	14	3	2	1	....	....

It will be seen, by the above Table, that the *number* of persons contracting marriage, under twenty years of age, has gradually diminished, and that, therefore, the *decrease in percentage* from the increased number of the whole, must be more than correspondingly large.

The following summary will show the whole number of persons married, the number of persons married under twenty years of age, and the percentages of marriages of persons under twenty years of age, during two periods of three years each, that is, from 1870 to 1872 inclusive, and from 1880 to 1882 inclusive, and during 1883:

	Whole number of persons married.	Number married under twenty years of age.	Percentage of persons married under twenty years of age.
1870 to 1873	14,470	2,227	15.4
1880 to 1883	16,306	1,775	10.8

The following exhibit will also give the percentages of whole number of persons of both sexes, married under twenty years of age, in

different years, taken at random, and will also show the decline in the proportions of the same:

Years.	Married under 20 years of age.
1870	15.9 per cent. of whole number.
1872	15.5 per cent. of whole number.
1876	15.3 per cent. of whole number.
1880	12.4 per cent. of whole number.
1883	9.5 per cent. of whole number.

PROPORTION OF SEX.

The following Table will show the percentages of *males* married, in each division of ages, in each of the last twenty-four years:

TABLE XXXVI.

	YEARS.	Under 20.	20 to 25.	25 to 30.	30 to 40.	40 to 50.	50 & over.	Total.
MALES.	1860	5.0	42.8	26.9	16.3	5.7	3.3	100.00
	1861	4.6	44.5	25.4	15.5	5.8	4.2	100.00
	1862	4.2	37.8	27.9	18.3	5.9	5.9	100.00
	1863	3.5	38.0	29.6	17.2	5.8	5.9	100.00
	1864	4.3	38.8	27.3	17.9	7.4	4.3	100.00
	1865	3.5	37.0	28.4	18.9	7.5	4.7	100.00
	1866	5.3	40.9	27.0	16.4	6.3	4.1	100.00
	1867	4.3	40.1	27.9	16.8	6.8	4.1	100.00
	1868	4.1	39.9	28.2	17.1	6.1	4.6	100.00
	1869	4.3	39.6	27.7	18.5	6.1	3.8	100.00
	1870	4.8	40.4	28.1	16.0	6.4	4.3	100.00
	1871	5 3	40.1	28.9	16.5	4.9	4.3	100.00
	1872	4.3	41.3	28.2	16.6	5.2	4.4	100.00
	1873	3.8	42.4	26.7	17.0	6.0	4.1	100.00
	1874	4.1	40.4	27.2	17.5	6.4	4.4	100.00
	1875	3.5	40.9	27.8	17.5	6.1	4.2	100.00
	1876	5.1	37.5	28.6	17.9	5.6	4.3	100.00
	1877	4.3	36.0	30.2	18 7	5.9	4.9	100.00
	1878	3.9	38.5	29.0	18.0	6.3	4.3	100.00
	1879	3.9	37.8	28.8	19.3	5.4	4.8	100.00
	1880	3.6	38.9	27.5	19.9	5.8	4.3	100.00
	1881	2.8	37.2	29.7	19.5	6.8	4.0	100.00
	1882	2.2	36.0	31.4	20.0	6.1	4.3	100.00
	1883	2.9	36.2	31.7	17.7	7.2	4.3	100.00

The following Table will show the percentages of *females* married, in each division of ages, in each of the last twenty-four years:

TABLE XXXVII.

	YEARS.	Under 20.	20 to 25.	25 to 30.	30 to 40.	40 to 50.	50 & over.	Total.
FEMALES.	1860	25.8	44.1	17.0	9.1	2.6	1.4	100.00
	1861	29.6	42.0	15.2	7.8	4.1	1.3	100.00
	1862	24.9	41.3	16.7	11.8	4.1	1.2	100.00
	1863	24.9	42.6	16.9	9.8	4.1	1.7	100.00
	1864	24.2	43.4	17.8	10.3	2.9	1.4	100.00
	1865	22.6	43.3	19.1	11.0	3.5	1.5	100.00
	1866	24.7	42.9	17.4	11.0	2.7	1.3	100.00
	1867	25.4	40.5	19.3	10.0	3.4	1.4	100.00
	1868	24.4	40.9	18.1	11.6	3.3	1.7	100.00
	1869	24.1	40.5	18.7	12.1	3.4	1.2	100.00
	1870	26.8	39.4	17.9	10.8	3.9	1.2	100.00
	1871	24.6	41.9	19.1	10.1	3.1	1.2	100.00
	1872	26.7	40.5	18.4	9.9	2.2	1.3	100.00
	1873	25.3	40.8	17.5	12.0	2.7	1.7	100.00
	1874	26.3	38.1	19.3	11.1	3.9	1.3	100.00
	1875	23.9	42.1	16.8	11.8	4.0	1.4	100.00
	1876	25.6	39.8	17.6	12.0	3.7	1.3	100.00
	1877	23.4	40.4	18.8	12.1	3.6	1.7	100.00
	1878	22.7	40.4	19.3	12.2	3.8	1.6	100.00
	1879	22.8	40.7	19.4	12.1	3.0	2.0	100.00
	1880	21.1	44.2	18.0	12.0	3.3	1.4	100.00
	1881	19.0	43.0	21.5	11.2	3.8	1.5	100.00
	1882	16.7	44.8	20.9	12.6	3.9	1.1	100.00
	1883	16.2	44.2	20.6	13.2	4.3	1.5	100.00

Tables XXXVI and XXXVII show the changes that have taken place in the percentages of the sexes, married in the different divisions of age, during the last twenty-four years.

In Table XXXVI it will be seen that the proportion of males married, under 20 years of age, has gradually lessened, with only temporary interruptions, from 5.0 per cent. of the whole number of males married, in 1860, to 2.9 per cent. of the same class married in 1883.

It will also be seen, in Table XXXVII, that the proportion of females under twenty years of age who have assumed the marital relation, during the last six years, is considerably smaller than during the first six shown in the Table.

MARRIAGES OF PERSONS OF COLOR.

The number of marriages of persons of color, in Rhode Island, in 1883, was 70. This includes two marriages of which one of the parties was white. The number and color of individuals were, therefore, 138 persons of color, and 2 persons white. The white persons were all females. The marriages, however, may be properly classed as colored marriages.

The number reported during 1883, from the different towns, was as follows, viz.:

Providence (including 1 of white and black)	54
Newport	8
East Greenwich (including 1 of white and black)	4
East Providence, Pawtucket, Charlestown, Westerly, } 1 each	4
Total	70

MARRIAGES OF THE DIVORCED.

The number of marriages, or persons married, of which one or both of the contracting parties had been divorced, is probably somewhat larger than the number given below.

The following exhibit will name the towns from which returns of marriage with the item of divorce were given, the whole number of divorced persons married, and also whether the second or third marriage of the divorced groom or bride:

TOWNS.	Whole Number.	Groom.	Bride.	Second Marriage of Groom.	Third Marriage of Groom.	Second Marriage of Bride.	Third Marriage of Bride.
Bristol	1	1	......	1	......	......	......
East Greenwich	1	1	......	1	......	......	......
Middletown	1	1	......	1	......	......	......
Newport City	5	2	3	2	......	3	......
Providence	103	50	53	47	3	50	3
North Kingstown	4	2	2	1	1	1	1
State	115	57	58	53	4	54	4

DIVORCES, 1883.

The number of applications for divorce in Rhode Island, during the year 1883, as ascertained by reports from the clerks of the supreme courts of the different counties, was (321) three hundred and twenty-one.

During the year 1883 there were (257) two hundred and fifty-seven applications for divorce granted, which were 14 less than in 1882.

The following Table shows the number of applications for divorce, and the number granted, in 1883, in each county of the State; also the causes alleged for the applications.

TABLE XXXVIII.

COUNTIES.	Number of Applications.	Number Granted.	Causes Alleged.							
			Adultery.	Extreme Cruelty.	Wilful Desertion.	Continued Drunkenness.	Neglect to Provide Necessaries, &c.	Other Gross Misbehavior.	Impotency.	Total Causes Alleged.
Bristol	6	6	......	......	5	1	3	4	......	13
Kent	17	15	3	......	4	2	8	......	......	17
Newport	19	9	6	3	16	2	8	......	.....	35
Providence	263	214	45	46	153	54	144	36	......	478
Washington	16	13	3	6	10	1	10	7	......	37
Whole State	321	257	57	55	188	60	173	47	......	580

The number of causes alleged as reasons why divorce should be granted, in the applications made during 1883, are much less numerous in proportion than in any previous year. The number, as seen in the above Table, was 580, as against 649 in 1882.

It is usual for applicants to make more than one allegation. Of the 580, the aggregate of all the causes alleged in 1883, there were

57 for adultery; 55 for extreme cruelty; 188 for wilful desertion; 60 for continued drunkenness; 173 for neglect to provide the necessaries of life; and 47 for various forms of gross misbehavior.

In order to show the actual number of applications, and the number of divorces granted in each of the last eleven years, the following summary is presented:

	Applications for Divorce.	Divorces Granted.	Applications refused or continued or withdrawn.
1873	261	173	88
1874	276	242	34
1875	227	158	69
1876	254	196	58
1877	257	178	79
1878	258	196	62
1879	255	246	9
1880	347	273	74
1881	350	268	92
1882	339	271	68
1883	321	257	64
11 years, total	3,145	2,458	697

During the last eleven years the proportion of decrees of divorce, to whole number of applications, was 78.1 per cent. During 1883 it was 80 per cent.

The number of applications has lessened during the last two years, as may be seen in the above Table.

The proportion of *divorces granted*, in 1883, to the whole number of marriages during the same year, was *one divorce* to every 10.2 marriages.

The proportion of *applications for divorce* to whole number of marriages, during the year, was one *application* to every 8.1 marriages.

The following Table shows the number of divorces granted in each county, and in the whole State, in each of the last fifteen years, with the proportion of marriages to each divorce granted in each year:

TABLE XXXIX.

YEARS.	Bristol County.		Kent County.		Newport County.		Providence County.		Washington County.		Whole State.	
	Divorces Granted.	Marriages to one Divorce.	Divorces Granted.	Marriages to one Divorce.	Divorces Granted.	Marriages to one Divorce.	Divorces Granted.	Marriages to one Divorce.	Divorces Granted.	Marriages to one Divorce.	Divorces Granted.	Marriages to one Divorce.
1869	10	10.6	15	12.5	6	27.7	120	13.8	11	15.5	162	14.1
1870	3	27.7	18	11.8	6	26.3	152	11.3	21	9.3	200	11.8
1871	5	16.8	11	17.9	4	49.7	123	13.3	18	11.4	161	14.5
1872	8	10.2	13	15.7	8	22.9	149	12.6	22	8.9	200	12.7
1873	6	16.2	22	9.8	8	21.9	131	14.8	6	33.7	173	15.2
1874	10	8.9	20	8.0	6	29.0	190	10.0	16	11.6	242	10.5
1875	2	50.0	18	8.8	7	23.4	120	14.9	11	20.5	158	15.7
1876	6	14.5	15	12.8	7	20.5	148	11.1	20	8.8	190	11.5
1877	7	12.0	9	16.3	7	26.0	134	12.4	21	9.9	178	12.8
1878	4	26.0	11	13.3	13	12.8	156	10.9	12	17.3	196	11.9
1879	5	18.8	19	9.0	7	24.1	195	9.1	20	9.7	246	9.7
1880	8	12.1	23	9.4	11	17.6	208	9.7	23	17.0	273	10.1
1881	6	20.1	26	7.3	10	16.9	207	10.0	19	11.0	268	10.4
1882	6	15.0	18	10.3	15	13.0	221	8.9	11	16.2	271	9.7
1883	6	15.8	15	11.5	9	21.2	214	9.2	13	13.3	257	10.2

The proportion of divorce to marriage in the whole State, during the year 1883, was one divorce to every 10.2 marriages, as before stated. The proportion is smaller than in the previous year, by about five per cent.

The proportions in the counties varied, as usual, increasing over the previous year in Washington county, and decreasing in all the other counties.

During fifteen years the average proportions of divorce to marriage, in the several counties and the State, have been as follows:

Bristol County............ One divorce to every 18.8 marriages.
Kent County............ One divorce to every 11.8 marriages.
Newport County............ One divorce to every 23.9 marriages.
Providence County............ One divorce to every 11.4 marriages.
Washington County............ One divorce to every 14.2 marriages.
Whole State............ One divorce to every 12.1 marriages.

It will be seen that in a series of years Newport county has furnished the least number of divorces, in proportion to the number of marriages, and Providence and Kent counties the largest number.

During the three years from 1869 to 1871 inclusive, the proportion was one divorce to every 13.5 marriages. From 1872 to 1876 inclusive it was one divorce to every 13.1 marriages. From 1877 to 1881 inclusive it was one divorce to every 11 marriages; and from 1882 to 1883 inclusive it was one divorce to every 9.9 marriages.

DEATHS, 1883.

The number of deaths that occurred in Rhode Island, during the year 1883, according to the returns made to the State Registrar, was five thousand two hundred and eighty-two (5,282).

As might be expected, the numbers increase from year to year with scarcely an exception, taking the whole State, but with some variations in the towns.

The proportion of deaths to living population, in 1883, was one death in every 52.4 persons; or 19.1 in each thousand persons, according to the census of 1880.

This ratio is larger than the real proportion, because of the increase of population since 1880. As remarked on a previous page, "Estimating the population of the State at 295,000 in June, 1883, the proportion of deaths to population during the year was 17.9 in each thousand, which was somewhat above the average of the previous five years."

SEX OF DECEDENTS.

Of the 5,282 persons whose deaths were returned, during the year 1883, 2,627 were males, and 2,655 were females; the ratio standing at 99.0 males to each 100 females, or 49.73 males and 50.27 females in each 100 decedents.

The following Tables, XL and XLI, show the number and proportion of males and females among the *decedents*, and also among the *children born* in Rhode Island during the ten years 1853 to 1862 inclusive; also in each of the twenty-one years from 1863 to 1883 inclusive, and for the entire period of thirty-one years:

TABLE XL.

DEATHS.

10 years, 1853-1862	10,930 males	11,269 females	or 96.9 males to 100 females.
1863	1,621 males	1,586 females	or 102.2 males to 100 females.
1864	1,633 males	1,727 females	or 94.5 males to 100 females.
1865	1,686 males	1,719 females	or 98.1 males to 100 females.
1866	1,497 males	1,473 females	or 101.5 males to 100 females.
1867	1,442 males	1,447 females	or 99.7 males to 100 females.
1868	1,413 males	1,499 females	or 94.3 males to 100 females.
1869	1,696 males	1,686 females	or 100.6 males to 100 females.
1870	1,588 males	1,650 females	or 96.2 males to 100 females.
1871	1,621 males	1,723 females	or 94.1 males to 100 females.
1872	2,118 males	2,129 females	or 99.4 males to 100 females.
1873	2.166 males	2,237 females	or 95.5 males to 100 females.
1874	2,111 males	2,118 females	or 99.7 males to 100 females.
1875	2,108 males	2,209 females	or 95.4 males to 100 females.
1876	1,969 males	2,147 females	or 91.7 males to 100 females.
1877	2,132 males	2,318 females	or 92.0 males to 100 females.
1878	2,161 males	2,280 females	or 94.8 males to 100 females.
1879	2,183 males	2,289 females	or 95.4 males to 100 females.
1880	2,366 males	2,463 females	or 96.0 males to 100 females.
1881	2,467 males	2,559 females	or 96.8 males to 100 females.
1882	2,487 males	2,587 females	or 96.5 males to 100 females.
1883	2,627 males	2,655 females	or 99.0 males to 100 females.
31 years	52,022 males	53,760 females	or 96.7 males to 100 females.

Table XLI.

BIRTHS.

10 years, 1853-1862	18,377 males	17,260 females	or 106.4 males to 100 females.
1863	1,892 males	1,788 females	or 105.8 males to 200 females.
1864	1,949 males	1,942 females	or 100.3 males to 100 females.
1865	2,096 males	1,857 females	or 112.9 males to 100 females.
1866	2,546 males	2,356 females	or 108.1 males to 100 females.
1867	2,655 males	2,464 females	or 107.7 males to 100 females.
1868	2,745 males	2,627 females	or 104.5 males to 100 females.
1869	2,685 males	2,560 females	or 104.9 males to 190 females.
1870	2,679 males	2,536 females	or 105.6 males to 100 females.
1871	2,878 males	2,800 females	or 102.8 males to 100 females.
1872	3,085 males	3,058 females	or 100.9 males to 100 females.
1873	3,135 males	2,887 females	or 108.6 males to 100 females.
1874	3,311 males	3,155 females	or 104.9 males to 100 females.
1875	3,362 males	3,146 females	or 106.9 males to 100 females.
1876	3,291 males	3,038 females	or 108.3 males to 100 females.
1877	3,163 males	3,072 females	or 103.0 males to 100 females.
1878	3,402 males	3,312 females	or 102.7 males to 100 temales.
1879	3,259 males	3,091 females	or 105.4 males to 100 females.
1880	3,241 males	3,054 females	or 106.1 males to 100 females.
1881	3,498 males	3,263 females	or 107.2 males to 100 females.
1882	3,509 males	3,316 females	or 105.8 males to 100 females.
1883	3,548 males	3,498 females	or 101.4 males to 100 females.
31 years	80,306 males	76,080 females	or 105.5 males to 100 females.

Table XL may be presented differently, that is, in three periods of ten years each, the year 1883, and one of thirty-one years, as follows:

DEATHS.	Males.	Females.	
10 years, 1853-1862	10,930	11,269	or 96 9 males to each 100 females.
10 years, 1863-1872	16,315	16,639	or 98.0 males to each 100 females.
10 years, 1873-1882	22,150	23,197	or 95.6 males to each 100 females.
1 year, 1883	2,627	2,655	or 99.0 males to each 100 females.
31 years	52,022	53,760	or 96.7 males to each 100 females.

By the footings of Tables XL and XLI it will be seen that, during the thirty-one years of registration, the proportions of the sexes who

have died during that time have been 96.7 males to every 100 females; and of the children born, during the same period of time, there have been 105.5 males to every 100 females.

SEASON AND MORTALITY.

The whole number of decedents, and the sex of the same, in each month of the year 1883, and in each division of the State, may be found in Table VI, on the seventeenth page.

The influence of season upon mortality may be further illustrated by the following Table, which shows the number and percentage of deaths in each quarter of each of the last five years, and in the aggregate for thirty-one years, from 1853 to 1883 inclusive:

TABLE XLII.

SEASON.	1883.		1882.		1881.		1880.		1879.		1853-1883.	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
January-March...	1,246	23.59	1,180	23.23	1,236	24,62	1,216	25.18	1,185	26.49	24,814	23.46
April-June........	1,321	25.00	1,186	23.24	1,171	23.34	1,149	23.80	939	20.99	22,239	21.02
July-September..	1,471	27.84	1,443	28.42	1,424	28.38	1,306	27.04	1,174	26.26	30,457	28.79
October-Dec'mb'r	1,244	2,357	1,265	25.11	1,185	23.66	1,158	23.98	1,174	26.26	28,272	26.73
Total...........	5,282	100.00	5,074	100.00	5,016	100.00	4,829	100.00	4,472	100.00	105,782	100.00

The proportion of decedents, in the first quarter of 1883, did not vary much from the average of the period of thirty-one years. The second and fourth quarters varied considerably, while the third differed by less than one per cent.

TABLE XLIII.

Showing the months in the order of largest mortality for eight years.

1883.		1882.		1881.		1880.		1879.		1878.		1877.		1876.	
1. July	537	August	589	August	576	July	488	January	468	December	421	September	454	August	469
2. August	499	November	461	January	439	August	430	August	452	August	420	August	450	July	444
3. April	475	September	444	July	434	March	426	December	395	July	410	October	430	December	348
4. January	452	July	410	October	426	January	422	October	391	January	400	July	413	March	341
5. May	445	May	406	April	417	October	416	November	388	March	396	December	411	September	336
6. October	443	December	405	September	414	April	400	July	383	November	377	November	398	October	334
7. March	442	April	401	May	410	May	392	March	382	February	362	March	347	May	332
8. September	435	October	399	March	401	September	388	April	342	April	350	May	343	April	329
9. December	409	January	398	February	396	December	377	September	339	September	345	January	323	February	312
10. June	401	February	392	December	385	February	368	February	335	October	342	April	310	January	295
11. November	392	March	390	November	374	November	365	May	318	June	310	June	305	November	295
12. February	352	June	379	June	344	June	357	June	279	May	308	February	266	June	281
	5,282		5,074		5,016		4,829		4,472		4,441		4,450		4,116

August and July are the months in which occurs the largest number of deaths, in periods of ten years or more. Occasionally, as may be seen in Table XLIII, other months take the lead, as when in December, 1878, and January, 1879, epidemics of diphtheria and pneumonia prevailed.

June and October are the healthiest months in the year, but they, sometimes, October in particular, take a moderately prominent position in the death rate scale, as when diseases not immediately fatal, occurring in previous months, reach the stage of exhaustion in those months. Many cases of consumption drag along through the winter and spring, and death occurs in June, because physical vitality is utterly spent. The wasting diseases of summer sometimes continue until complete exhaustion occurs in October.

PARENTAGE OF DECEDENTS.

The number of decedents in 1883, of the two general classes of parentage, that is, American and foreign, may be found in Table I, on pages 10 and 11.

Of the whole number of decedents, 5,282, reported in 1883, 2,652 were of American, and 2,630 were of foreign parentage.

By the term "foreign parentage" is meant the decedents whose fathers were born in some other country and not in the United States. The grandchildren of foreign born grandfathers are not reckoned as of foreign parentage, if their own fathers were born in the United States.

There are nine towns which reported a larger number of decedents of foreign parentage than of American.

But four towns reported no decedents of foreign parentage.

More than three-fourths of the decedents in Woonsocket were of foreign parentage.

Among the nine towns reporting a larger number of decedents of foreign parentage than of American, are the following, with the proportions of the same:

Cranston	131 of foreign parentage to each 100 of American.
Cumberland	160 of foreign parentage to each 100 of American.
Lincoln	189 of foreign parentage to each 100 of American.
North Smithfield	184 of foreign parentage to each 100 of American.
Pawtucket	139 of foreign parentage to each 100 of American.
Woonsocket	309 of foreign parentage to each 100 of American.
Providence City	122 of foreign parentage to each 100 of American.

The following Table gives the number and percentage of decedents of American and of foreign parentage, in each of the last five years; and in the aggregate for twenty-two years, or from 1858 to 1879 inclusive:

TABLE XLIV.

PARENTAGE.	1883.		1882.		1881.		1880.		1879.		1858–1879.	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
American	2,652	50.21	2,429	47.87	2,482	49.48	2,517	52.13	2,294	51.29	52,332	56 25
Foreign	2,630	49.79	2,645	52 13	2.534	50.52	2,312	47.87	2,178	48.71	40,702	43 75
Total............	5,282	100 00	5.074	100.00	5,016	100.00	4,829	100.00	4,472	100.00	93,034	100.00

AGE OF DECEDENTS.

There may be found in Table I, on pages 10 and 11, the aggregate and average age of all the decedents reported in 1883, of each sex, in each town and county in the State.

It will be seen, by that Table, that the average age of all the male decedents in 1883 was 33.64 years, and the average age of all the female decedents, in the same year, was 37.44 years.

The average age of all decedents was 35.55 years, which is the highest average of any year since the returns of death acquired anything like completeness in number and detail.

The following summary will show the average age of each of the sexes, and of all, in each of the last six years:

	1883.	1882.	1881.	1880.	1879.	1878.
	Average.	Average.	Average.	Average.	Average.	Average.
Males...	33.64 years	31.33 years	30.99 years	29.62 years	31.29 years	29.02 years.
Females	37.44 years	35.57 years	34.07 years	32.06 years	33.24 years	31.11 years.
Ages of all...	35.55 years	33.50 years	32.55 years	30.86 years	32.29 years	30.00 years.

The average age of decedents has surely increased in Rhode Island, during the last twenty-five years, notwithstanding the introduction into the State of a large class of population of unsanitary habits and prolific of progeny, and of whose children a large proportion die early from lack of suitable diet, clothing, cleanliness, and want of proper care and attention in health and in sickness.

For a ready reference the following Table, continued from a previous report, will show the whole number of deaths, the average annual percentage of deaths to estimated average population, and average age of all decedents during ten years, from 1870 to 1880, in each town and in each county in the State.

It should be stated that, in estimating the average population during the period of ten years, corrections were made for losses by division of territory, and also for gains of population by addition of territory, where such changes have occurred.

It may be stated, also, that changes in the character of the population in some of the towns, during the last half of the ten years, seemed to have an influence in the direction of increase of the death rate in those towns.

TABLE XLV.

TOWNS AND DIVISIONS OF THE STATE.	DEATHS.			
	Whole No. Deaths, 10 years.	Average to population one in every	Per cent.	Average Age of all.
Barrington	142	83.45	1.19	43.12
Bristol	904	64.37	1.55	34.66
Warren	656	61.05	1.64	31.98
BRISTOL COUNTY	1,702	64.74	1.54	33.77
Coventry	672	68.15	1.47	40.77
East Greenwich	500	62.40	1.63	40.17
West Greenwich	177	58.42	1.71	45.78
Warwick	1,461	79.49	1.26	29.15
KENT COUNTY	2,810	72.41	1.38	35.29
Jamestown	42	116.19	.86	51.62
Little Compton	140	82.57	1.21	53.69
Middletown	124	86 61	1.15	45.03
New Shoreham	111	103.33	.96	37.39
Portsmouth	216	87 64	1.14	47.32
Tiverton	285	73.72	1.36	43 05
TOWNS, NEWPORT COUNTY	918	85.61	1.17	45.66
NEWPORT CITY	2,041	68.73	1.45	36.51
NEWPORT COUNTY	2,959	73.97	1.35	39.35
Burrillville.*	677	77.53	1.29	33.92
Cranston ‡	1,045	54 43	1.82	37.72
Cumberland	640	88 64	1.13	30.56
East Providence	592	73.24	1.36	28.26
Foster	151	102 20	.98	53.14
Glocester	335	62.03	1.61	44.93
Johnston	745	67.10	1.49	30.94
Lincoln*	1,575	55.21	1.81	22.14
North Providence†	113	69.18	1.45	29.60
North Smithfield*	322	78.17	1.26	32 15
Pawtucket	2,062	55.22	1.82	29.81
Scituate	547	74 97	1.32	40 39
Smithfield.*	421	67.86	1.47	36.12
Woonsocket	2,628	51.66	1.92	24.49
TOWNS, PROVIDENCE COUNTY	13,440	62.68	1.59	29.15
PROVIDENCE CITY	17,587	50.24	1.99	27.76
PROVIDENCE COUNTY	31,027	59.60	1.67	28.37
Charlestown	151	69.80	1.42	54.33
Exeter	159	85.22	1.17	51 58
Hopkinton	392	70.41	1.42	40 78
North Kingstown	553	63 38	1.58	40.76
South Kingstown	602	70.43	1.41	43.99
Richmond	299	58.46	1.71	38.18
Westerly	603	89.68	1.11	34.66
WASHINGTON COUNTY	2,759	72.71	1.37	40.52
WHOLE STATE	41,257	62.59	1·59	30.68

* Nine years. † Six years. ‡ Including deaths in State Institutions.

The following Table shows the average age of the decedents in each of the larger divisions of the State, in each of the last five years, and also the average of each of five periods of five years each, comprising the twenty-five years from 1858 to 1882 inclusive:

TABLE XLVI.

DIVISIONS OF THE STATE.	1883.	1882.	1881.	1880.	1879.	1878–1882. 5 years.	1873–1877. 5 years.	1868–1872. 5 years.	1863–1867. 5 years.	1858–1862. 5 years.
Bristol County	39.24	39.31	37.74	36.43	40.87	36.68	33.61	35.12	34.78	35.56
Kent County	41.36	39.73	34.46	36.54	35.15	37.11	36.20	34.77	35.81	32.15
Newport County	40.66	37.00	40.03	42.38	37.62	39.21	40.68	40.04	33.54	35.01
Providence County Towns	34.56	31.83	30.35	27 40	32.45	30.60	28.46	25.26	29.16	28.44
Providence City	33.18	31.88	30.98	29.67	28.82	29.50	27.19	25.45	28.50	25.78
Washington County	47.42	40.32	41.13	37.82	43.44	41.01	41.14	39.67	30.87	34.21
Whole State	35.55	33.50	32.55	30.86	32.29	31.84	30.28	31.66	30.75	29.42

Table XLVI shows very conclusively that the average age at death, in Rhode Island has advanced during the last twenty-five years. The average, in 1883, about thirty-five and a half years; the average of the last three years, about thirty-three and one-half; the average of the last five, about thirty-three years; as against the average of about twenty-nine and one-half years, during the first five years of the long period, and thirty and three-fourths years, during the second five years of the long period.

PERCENTAGE OF DECEDENTS BY DIFFERENT AGES.

In Table VII, on pages 18 to 23 inclusive, will be found the number of deaths in 1883, in each town and each county, of each sex, and in each period of life, with the percentage of the whole number of deaths in each division to the population of the same, by the census of 1880.

The following Table shows the percentages of decedents in each division of ages, to whole number of deaths, in each of the last six years, and in the aggregate for three periods; one of ten years and seven months, from June 1st, 1852, to December 31st, 1862, inclusive; one of ten years, from 1863 to 1872 inclusive; and one of ten years, from 1873 to 1882 inclusive:

TABLE XLVII.

PERIODS OF LIFE.	1883.	1882.	1881.	1880.	1879.	1878.	10 years. 1873 to 1882.	10 years. 1863 to 1872.	10 years, 7 months. 1852 to 1862.
Under 1 year	18.1	19.7	18.5	18.4	16.1	16.6	18.9	18.0	17.6
1 and under 2	5.1	5.3	6.4	7.0	6.8	8.1	7.6	7.8	9.8
2 and under 5	4.4	6.5	7.9	9.2	10.1	10.3	8.4	7.9	9.6
Total under 5	27.6	30.5	32.8	34.6	33.0	35.0	34.9	33.7	37.0
5 and under 10	3.4	3.7	4.6	6.2	6.3	6.2	5.0	4.6	5.0
10 and under 20	5.4	5.8	5.2	4.8	4.8	6.1	5.8	6.2	5.8
20 and under 30	10.3	10.6	9.6	8.6	8.8	8.8	9.2	9.7	9.5
30 and under 40	8.4	9.3	8.0	7.6	7.4	7.6	7.8	8.1	8.7
40 and under 50	7.6	7.6	7.6	6.6	6.5	6.4	6.9	7.2	7.5
50 and under 60	9.0	7.3	8.2	6.7	7.1	7.6	7.2	7.3	6.7
60 and under 70	9.2	8.4	8.8	8.5	10.0	7.9	8.2	8.3	6.9
70 and under 80	10.5	9.7	8.6	9.4	9.0	8.8	8.8	8.4	7.3
80 and under 90	6.5	5.6	5.4	5.7	5.5	4.8	5.1	5.4	4.6
Over 90 and not stated..	2.1	1.5	1.2	1.3	1.6	0.8	1.1	1.1	1.0
Total..................	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

The proportion of deaths of persons under five years of age, 27.6 per cent., in 1883, was unprecedented in the whole period of registration since 1852. The average of a period of thirty years previous was 35.2 per cent. The average of five years previous was 33.2 per cent. The absence of epidemics of cholera infantum, diphtheria, scarlatina, etc., throughout the State, except for short periods and few localities, can alone account for the fact.

The proportion, too, of deaths of persons over sixty years of age, more than 28 per cent., is unprecedently large. The average of thirty years was 22.1 per cent.

COLORED DECEDENTS.

The number of decedents of color, in Rhode Island in 1883, was 166.

There were 21 more than in 1882.

They occurred in the different towns as follows:

Providence City		120
Newport City		26
Cranston, State Institutions		6
Bristol, Warwick.	3 each	6
Pawtucket, South Kingstown.	2 each	4
East Providence, Warren, Scituate, North Kingstown.	1 each	4
Total		166

Sex.—There were, of the 166 decedents of color, 78 males and 88 females.

Season.—These 166 deaths were in the different months as follows:

Months.	Deaths.	Months.	Deaths.	Months.	Deaths.	Months.	Deaths.
January	13	April	17	July	18	October	17
February	10	May	13	August	18	November	8
March	15	June	14	September	13	December	12
1st Quarter	38	2d Quarter	44	3d Quarter	47	4th Quarter	37

First six months, 82: Second six months, 84. Total, 166.

The following summary will show the proportions, to the whole colored population, of each of the events of birth, marriage and death of colored persons, during the six years from 1878 to 1883 inclusive:

	One birth in every	One person married in every	One death in every
1878	36.4	39.2	40.2
1879	39.6	51.4	37.3
1880	47.1	43.3	44.0
1881	34.3	39.2	35.4
1882	36.8	44.5	45.4
1883	33.4	63.3	39.7

The following exhibit will show the number of births, marriages and deaths among the colored population of Rhode Island, in each of the last twenty-three years, from 1861 to 1883 inclusive, and also the aggregates of the same:

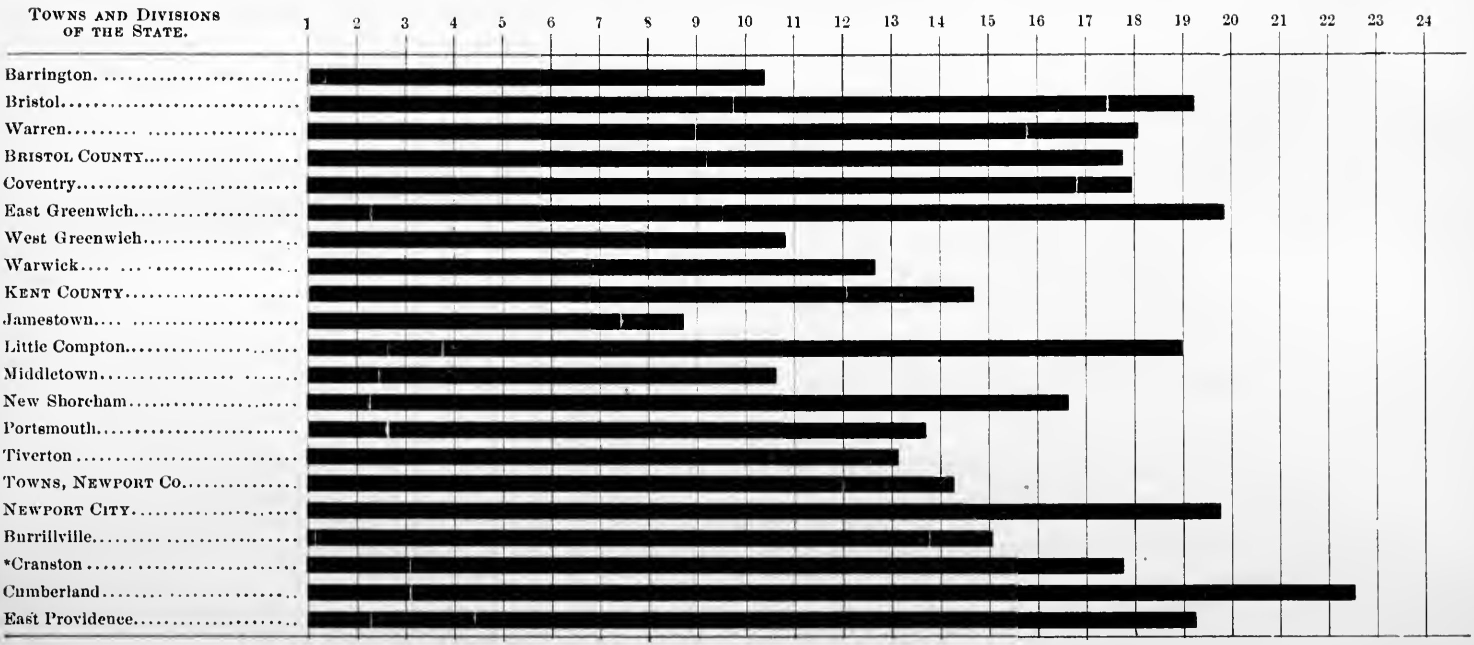
COLORED POPULATION.

1861	97 births	30 marriages	109 deaths.
1862	96 births.	23 marriages	90 deaths.
1863	73 births	68 marriages	104 deaths.
1864	69 births	35 marriages	121 deaths.
1865	87 births	51 marriages	129 deaths.
1866	124 births	65 marriages	123 deaths.
1867	144 births	61 marriages	105 deaths.
1868	147 births	84 marriages	111 deaths.
1869	136 births	70 marriages	133 deaths.
1870	158 births	70 marriages	128 deaths.
1871	146 births	64 marriages	116 deaths.
1872	171 births	76 marriages	184 deaths.
1873	163 births	69 marriages	160 deaths.
1874	170 births	80 marriages	151 deaths.
1875	156 births	76 marriages	169 deaths.
1876	170 births	59 marriages	156 deaths.
1877	168 births	64 marriages	160 deaths.
1878	172 births	80 marriages	156 deaths.
1879	159 births	61 marriages	168 deaths.
1880	140 births	76 marriages	153 deaths.
1881	192 births	84 marriages	186 deaths.
1882	179 births	74 marriages	145 deaths.
1883	197 births	52 marriages	166 deaths.
Total	3,314 births	2,472 marriages	3,223 deaths.

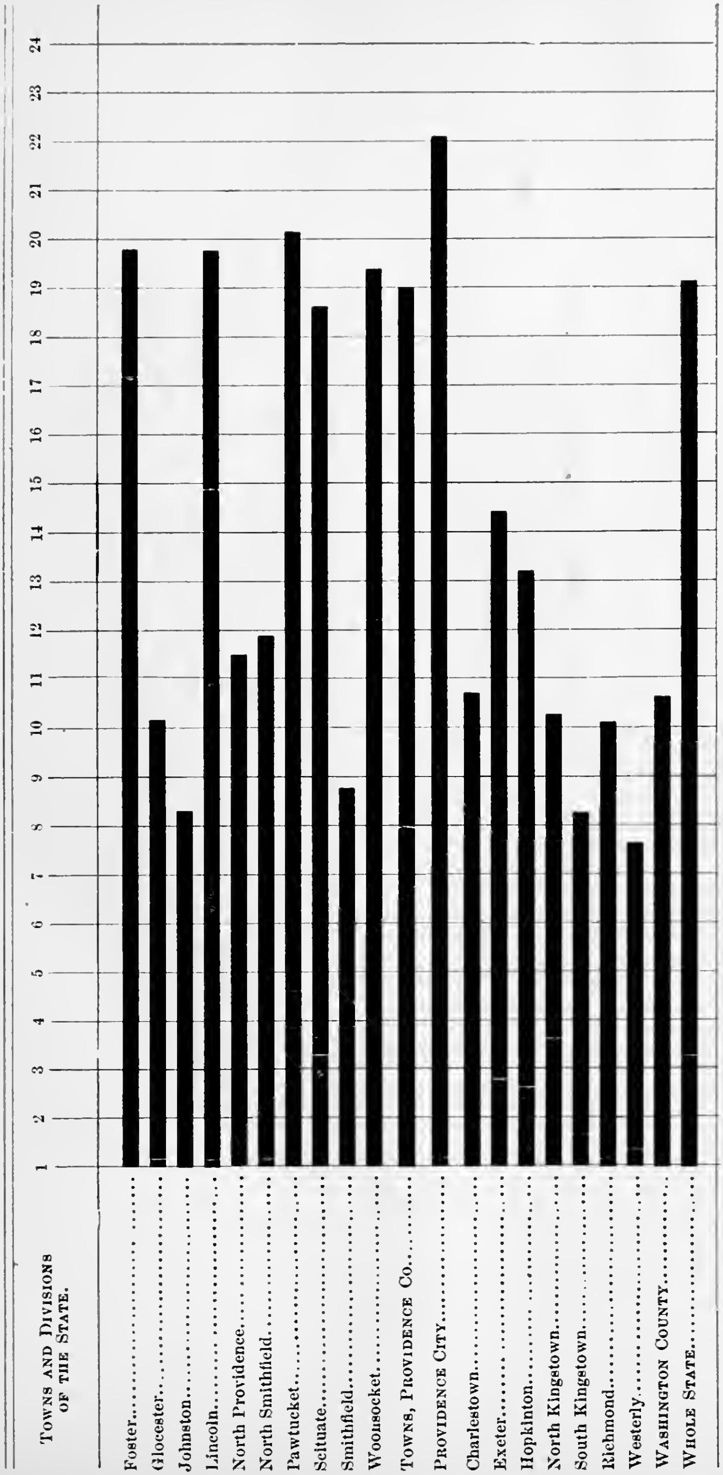
DEATH RATES.

Diagram showing the number of deaths in each 1000 of the population, in each town and each county in the State, during the year 1883, computed by the Census of 1880.

For explanation see foot note on next page.



* Excluding State Institutions.



The figures at the top of the perpendicular lines indicate, in whole numbers, the number of deaths during the year in every 1000 persons. The spaces are fractional parts of one. For instance, the heavy horizontal line against Barrington reaches one-third across the space between the perpendicular lines 10 and 11. It shows the death rate of Barrington in 1883, was about ten and one-third in every 1000 of the population, according to the census of 1880.

CAUSES OF DEATH, 1883.

The statistics of the causes of death in Rhode Island, in 1883, may be found in Tables VIII, IX, X and XII. The whole number of deaths, as previously stated, was 5,282. The number of which the cause of death was reported was 5,096, and the number of which the cause was not stated was 186.

The following Table shows the number of deaths in 1883, in each large division of the State, and the number and proportion in each division of which the cause was reported unknown:

TABLE XLVIII.

1883.	Bristol County.	Kent County.	Newport County Towns.	Newport City.	Providence County Towns.	Providence City.	Washington County.	Whole State.
Number of deaths	202	302	119	311	1,770	2,357	221	5,282
Cause not stated	5	19	7	22	114	6	13	186
One in	40.4	15.9	17.0	14.1	15.3	392.8	17.0	28.4

It is very gratifying to be able to remark that the proportion of deaths returned, during 1883, with cause of same unknown, was less than during any year since the commencement of systematic registration. There were 186, as against 282 in 1882. There were three deaths returned as sudden with name of cause, which could not be pathologically correct, and probably did not express the informers' meaning. They were included among the unclassified in Table X.

Table XLIX.

Showing the proportion of deaths reported, with "cause unknown," in each division of the State, and in the whole State, in each of the last twenty-one years, from 1863 to 1883 inclusive.

YEARS.	Bristol County.	Kent County.	Newport County.	Providence County Towns.	Providence City.	Washington County.	Whole State.
1863, One in	16.5	11.2	25.5	6.9	46.7	24.7	14.7
1864, One in	57.0	12.6	11.6	8.5	45.7	47.6	16.1
1865, One in	64.3	27.4	13.4	8.2	55.0	32.9	16.4
1866, One in	163.0	11.4	22.4	9.5	45.0	23.3	17.3
1867, One in	....	13.6	34.5	7.4	64.0	14.3	14.8
1868, One in	33.2	5.0	20.3	5.2	46.2	10.1	10.1
1869, One in	41.2	5.8	52.8	5.3	83.6	16.1	11.3
1870, One in	....	19.3	23.6	11.8	90.2	26.9	23.6
1871, One in	151.0	81.2	7.9	8.4	83.6	9.8	13.0
1872, One in	13.3	5.8	10.0	6.8	72.8	9.8	11.3
1873, One in	....	16.0	25.4	9.8	102.5	27.5	20.3
1874, One in	54.0	15.2	14.0	17.2	73.7	21.2	27.8
1875, One in	55.0	7.4	15.6	13.7	91.2	11.9	20.9
1876, One in	11.5	7.9	18.5	9.9	124.3	22.8	19.3
1877, One in	....	17.7	9.7	11.9	323.0	16.0	23.2
1878, One in	32.1	7.4	9.0	13.7	124.2	21.7	21.1
1879, One in	16.6	9.2	12.4	9.5	225.1	8.6	17.6
1880, One in	21.9	23.5	13.5	10.5	122.3	17.8	20.7
1881, One in	204.0	13.0	11.2	7.3	143.0	6.5	14.4
1882, One in	37.6	11.6	10.9	10.6	187.0	7.7	18.8
1883, One in	40.4	15.9	15.0	15.3	392.8	17.0	28.4

The following summary will show the proportion of all deaths reported with cause unknown, to whole number of deaths, in each of the several divisions, during the last twenty-one years:

Bristol County.............................One death, *cause unknown*, in every 49.0 decedents.

Kent County................................One death, *cause unknown*, in every 16.0 decedents.

Newport County.............................One death, *cause unknown*, in every 17.9 decedents.

Providence County Towns... ....One death, *cause unknown*, in every 9.9 decedents.

Providence City............................One death, *cause unknown*, in every 119.1 decedents.

Washington County... ....One death, *cause unknown*, in every 18.9 decedents.

Whole State................................One death, *cause unknown*, in every 18.9 decedents.

The proportion of deaths in the whole State, reported with cause unknown during the first ten of the above twenty-one years, that is, from 1863 to 1872 inclusive, was one in every 14.8, or six and seven-tenths in each hundred decedents.

During the eleven following years, that is, from 1873 to 1883 inclusive, the proportion of deaths returned, with statement of cause unknown, was one in every 20.6, or four and eight-tenths of each hundred decedents.

PRINCIPAL CAUSES OF DEATH.

The following Table gives the number of deaths in Rhode Island, from each of thirteen principal causes, showing the order in regard to number, in each of the last five years; and also the aggregates and proportions of the same causes of death, for thirty years and seven months, from June 1st, 1852, to December 31st, 1882:

Table L.

Showing the order in regard to number and proportion of decedents from thirteen principal causes of death.

1883.		1882.		1881.		1880.		1879.		June 1st, 1852, to Dec. 31st, 1882—30 yrs. 7 mos.		Percentage of whole number of deaths, 30 years, 7 mos.
Whole Number	5,282	Whole Number	5,074	Whole Number	5,016	Whole Number	4,829	Whole Number	4,472	Whole Number	101,230	100.00
Consumption	766	Consumption	737	Consumption	706	Consumption	642	Consumption	637	Consumption	16,025	15.83
Pneumonia and Conges of Lungs	400	Pneumonia and Conges. of Lungs	344	Pneumonia and Conges. of Lungs	327	Scarlatina	468	Pneumonia and Conges. of Lungs	317	Pneumonia and Conges. of Lungs	6,099	6.02
Heart, Diseases of	325	Cholera Infantum	325	Heart, Diseases of	264	Pneumonia and Conges. of Lungs	364	Scarlatina	311	Old Age	5,408	5.34
Apoplexy and Paralysis	275	Old Age	283	Old Age	247	Old Age	273	Diphtheria	259	Cholera Infantum	5,143	5.08
Old Age	275	Apoplexy and Paralysis	265	Cholera Infantum	240	Cholera Infantum	247	Apoplexy and Paralysis	220	Scarlatina	4,398	4.34
Fevers, Typhoid, &c	258	Heart, Diseases of	255	Diphtheria	216	Heart, Diseases of	231	Old Age	220	Dysentery and Diarrhœa	4,210	4.15
Cholera Infantum	242	Fevers, Typhoid, &c	229	Brain, Diseases of	179	Apoplexy and Paralysis	215	Heart, Diseases of	202	Heart, Diseases of	3,947	3.90
Diarrhœa and Dysentery	184	Brain, Diseases of	173	Apoplexy	146	Fevers, Typhoid, &c	158	Cholera Infantum	161	Fevers, Typhoid, &c	3,755	3.71
Brain, Diseases of	179	Accidents	166	Cancers	145	Diphtheria	152	Cancer (all kinds)	125	Apoplexy and Paralysis	3,527	3.48
Cancers	169	Dysentery and Diarrhœa	158	Fevers, Typhoid, &c	143	Accidents	137	Fevers, Typhoid, &c	123	Accidents (all kinds)	3,018	3 08
Accidents	153	Cancers	132	Accidents	142	Convulsions, &c	133	Convulsions, &c	104	Diphtheria*	2,949	*2.91
Convulsions	126	Convulsions	110	Scarlatina	138	Cancers	125	Accidents	102	Convulsions and Fits	2,203	2.17
Diphtheria	95	Diphtheria	101	Dysentery and Diarrhœa	119	Dysentery and Diarrhœa	98	Croup	96	Croup	2,013	1.98

* 25 years, 1858 to 1882 inclusive.

As usual, consumption leads all other diseases as a cause of death, during 1883. The number increases from year to year with scarcely any variation, unless the proportion of deaths from that cause to the population be excepted. It has been shown, in the last two Reports on Registration, that the ratio to the living population has diminished during the last fifteen years.

Pneumonia is a second leading cause in nearly every year, the exceptions occurring only when some contagious disease has large and fatal epidemic prevalence.

Diseases of the heart have gradually increased in proportion as well as in number, and, during 1883, for the first time, have been the third largest cause of mortality.

Fevers, also, as a cause of death, were unusually prominent, during 1883. The proportion is larger than during any year since 1865, when they were third in the order of largest mortality.

Other changes will appear, on consultation of the Table on the previous page.

In the following Table will be found a summary of facts connected with twenty leading causes of death, in 1883 :

TABLE LI.

A summary of deaths in Rhode Island in 1883, from twenty leading causes, showing the number, sex, parentage, season, ages and localities.

		Accidents.	Apoplexy and Paralysis.	Brain, Diseases of.	Bronchitis.	Cancer.	Cholera Infantum.	Consumption.	Croup.	Diarrhœa.	Diphtheria.	Dysentery.	Fevers, Typhoid, &c.	Heart, Diseases of.	Hooping Cough.	Kidneys, Disease of.	Liver, Disease of.	Old Age.	Pneumonia and Congestion of Lungs.	Scarlatina.	Stomach, Diseases of.
Number of decedents from each cause		153	275	179	111	169	242	766	71	128	95	54	258	325	9	121	38	275	400	34	16
Sex	Males	117	138	93	56	61	124	358	32	66	39	20	146	167	6	68	19	105	192	17	7
	Females	36	137	86	55	108	118	408	39	62	56	34	112	158	3	53	19	170	208	17	9
Par'age	American	61	192	94	51	105	104	286	33	64	45	24	117	159	5	70	15	184	198	14	9
	Foreign	92	83	85	60	64	138	480	38	64	50	30	141	136	4	51	23	91	202	20	7
Season	January	12	29	20	8	9	....	60	13	5	13	....	27	25	2	8	4	34	58	3	....
	February	11	19	8	11	14	3	57	9	7	6	3	11	24	....	8	3	15	37	4	1
	March	9	19	8	17	13	2	67	8	7	5	...	17	29	3	8	4	35	61	1	....
	April	9	18	19	19	16	2	78	3	2	1	1	37	41	....	10	....	29	60	4	1
	May	11	28	14	8	16	4	79	5	4	9	2	14	26	....	15	4	20	48	5	1
	June	14	22	17	6	22	14	62	2	6	9	8	8	20	....	11	5	15	28	....	2
	July	20	23	15	3	15	98	51	2	26	5	13	15	26	1	12	3	24	13	1	3
	August	20	25	19	5	8	69	54	2	42	4	9	14	24	1	10	2	26	7	1	5
	September	11	27	18	4	19	29	51	6	13	15	8	38	24	....	10	4	17	16	2	2
	October	16	21	15	5	11	12	61	6	11	14	5	40	26	....	13	5	23	20	3	1
	November	10	15	10	11	14	4	75	8	1	6	4	19	31	1	10	2	6	24	5	....
	December	10	30	16	14	13	5	71	7	4	8	1	18	29	1	6	2	31	28	5	....

TABLE LI.—Continued.

A summary of deaths in Rhode Island in 1883, from twenty leading causes, showing the number, sex, parentage, season, ages and localities.

		Accidents.	Apoplexy and Paralysis.	Brain, Diseases of.	Bronchitis.	Cancer.	Cholera Infantum.	Consumption.	Croup.	Diarrhœa.	Diphtheria.	Dysentery.	Fevers, Typhoid, &c.	Heart, Diseases of.	Hooping Cough.	Kidneys, Disease of.	Liver, Disease of.	Old Age.	Pneumonia and Congestion of Lungs.	Scarlatina.	Stomach, Diseases of.
Ages.	Under 5 years	23	4	86	56	....	242	24	59	70	58	23	22	12	9	1	1	....	88	23	3
	5 and under 10	15	1	22	2	...	....	4	10	1	31	3	14	6	....	1	....	....	15	11	....
	10 " " 15	13	1	8	....	....	....	10	1	....	3	....	25	6	....	2	1	...	2	....	....
	15 " " 20	7	2	6	....	....	....	74	....	....	1	1	46	15	....	4	....	....	13	....	....
	20 " " 30	13	4	7	2	3	....	250	....	2	1	1	75	13	....	16	1	....	32	....	1
	30 " " 40	16	11	7	5	16	....	150	1	6	....	3	31	21	....	10	3	....	33	....	....
	40 " " 50	17	19	5	4	28	....	101	....	8	....	2	12	33	....	14	7	....	40	....	3
	50 " " 60	14	45	16	9	52	....	66	....	9	....	4	11	52	....	31	10	..	53	...	2
	60 " " 70	18	56	9	10	33	....	48	....	7	....	7	10	65	....	18	6	10	49	....	4
	70 " " 80	9	83	12	15	22	....	24	....	9	1	5	8	76	....	18	5	78	46	....	3
	80 and over	7	49	1	8	15	....	8	....	15	....	5	2	26	....	4	4	187	27	....	....
	Not stated	1	....	....	....	....	....	7	....	1	....	....	2	....	....	2	....	....	2	....	....
Locality.	Bristol County	4	11	8	5	3	12	19	1	3	1	4	9	8	1	4	2	17	19	1	1
	Kent County	8	28	13	2	17	7	39	6	2	7	5	16	27	....	2	4	18	21	1	2
	Newport County Towns	1	7	3	....	3	2	8	2	2	1	4	4	11	...	5	....	15	12	1	....
	Newport City	8	15	10	3	8	20	47	2	7	2	3	6	19	....	12	3	29	22	4	....
	Providence County Towns	63	75	52	42	50	88	257	25	54	26	20	82	70	4	30	13	91	108	9	6
	Providence City	66	118	89	57	86	108	364	35	51	54	16	134	172	4	60	14	84	204	16	5
	Washington County	3	21	4	1	2	5	32	...	1	4	2	7	18	....	8	2	21	14	2	2

COMMENTS.

In the following remarks upon several of the principal causes of death, in Rhode Island, during the year 1883, an alphabetical order will be followed, as presented in Table LI.

DEATHS FROM ACCIDENTS.

The number of deaths from accidental causes of all kinds, reported in Rhode Island, in 1883, was 153. This number is 13 less than in 1882.

Of these 153 deaths 18 were from burns and scalds; 27 by drowning; 21 from falls; 6 from poisoning; 16 from railroad accidents; 12 from asphyxia, and 53 from accidents too numerous to specify.

Of the whole number of deaths by accident 117 were males, and 36 were females; 61 were of American, and 92 were of foreign parentage.

Of the sexes the proportion was 76 per cent. of male decedents, to 24 per cent. of female decedents. Of parentage, 66 per cent. was of foreign, and 34 per cent. of American.

The number of deaths in each division of the year was as follows:

First Quarter	32	Third Quarter	51
Second Quarter	34	Fourth Quarter	36
First half	66	Second half	87
Whole Year	153		

In regard to periods of life, the decedents from accidental causes were divided as follows: Under 5 years, 23; 5 and under 10, 15; between 10 and 20, 20; between 20 and 40, 29; between 40 and 60, 31; over 60, 34; and 1, age not stated.

In regard to sectional divisions of the State, 4 of the deaths from accidental causes were in Bristol county; 8 in Kent county; 9 in Newport county; 3 in Washington County, and 129 in Providence county.

The whole number of deaths from accidental causes, in 1883, *in proportion to the whole number of deaths* from specified causes, in the State, was about three per cent.

APOPLEXY AND PARALYSIS.

There were 275 deaths from apoplexy and paralysis in Rhode Island, in 1883, according to the returns. The number reported is 10 more than in the year 1882, and 31 more than in 1881.

The following Table will present some of the social and local relations of apoplexy and paralysis, as causes of death, during the last nineteen years:

Table LII.

Showing the whole number and percentage of the Deaths in the State, from Apoplexy and Paralysis combined; and also the Sex and Parentage of the Decedents from these causes, and the number of the same in each of the Counties, from 1865 to 1883 inclusive.

YEARS.	Whole Number of Deaths.	APOPLEXY AND PARALYSIS.											
		Number from Apoplexy and Paralysis.	Per cent.	SEX.		PARENTAGE.		DIVISIONS OF THE STATE.					
				Males.	Females.	American.	Foreign.	Bristol County.	Kent County.	Newport County.	Providence County Towns.	Providence City.	Washington County.
1865......	3,405	100	2.93	52	48	81	19	9	8	14	23	38	8
1866......	2,970	92	3.09	46	46	80	12	8	5	17	24	29	9
1867......	2,889	124	4.29	59	65	101	23	9	9	13	35	49	9
1868......	2,912	111	3.81	56	55	86	25	9	6	19	27	46	4
1869......	3,382	117	3.46	55	62	92	25	12	13	18	20	48	6
1870......	3,238	130	4.32	68	62	105	25	14	10	10	39	52	5
1871......	3,344	156	4.66	73	83	113	43	10	17	15	40	61	13
1872......	4,247	125	2.97	62	63	96	29	17	9	10	27	52	10
1873......	4,403	134	3.04	59	75	109	25	9	8	17	26	57	17
1874......	4,229	156	3.69	84	72	120	36	14	10	16	42	59	15
1875......	4,317	166	3.61	79	87	133	33	7	13	17	46	75	8
1876......	4,116	165	4.01	79	86	130	35	13	11	13	45	68	1
1877......	4,450	181	4.07	87	94	123	58	10	10	16	52	74	19
1878......	4,441	188	4.23	104	84	145	43	12	16	21	58	66	15
1879......	4,472	220	4.92	114	106	146	74	12	9	29	71	89	10
1880......	4,829	215	4.67	109	106	157	58	18	13	22	71	78	13
1881......	5,016	244	4.86	116	128	170	74	17	15	25	70	101	16
1882......	5,074	265	5.22	139	126	168	97	15	29	25	65	117	15
1883......	5,282	275	5.22	138	137	192	83	11	28	22	75	118	21
Total.....	77,030	3,164	4.02	1,561	1,585	2,347	817	226	239	338	856	1,277	228

An inspection of the above Table will show, very conclusively, that apoplexy and paralysis, as causes of death, have gradually and almost regularly acquired a greater prominence.

From a percentage of less than three per hundred of all causes of death, in 1865, the proportion has increased to about five and one-quarter per hundred, during the last two years.

Table LIII.

Showing the ages of Decedents from Apoplexy and Paralysis, in each of the last nineteen years.

APOPLEXY AND PARALYSIS.	Periods of Life.								
	Under 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	80 and over.	Not stated.
1865	.....	3	5	6	19	20	28	19	.....
1866	1	1	7	16	9	24	27	7	.....
1867	2	.....	6	6	15	38	40	17	.....
1868	2	3	3	11	16	27	31	16	2
1869	1	1	5	12	20	28	34	15	1
1870	4	1	10	9	12	33	41	20	.....
1871	3	4	7	14	21	46	45	15	1
1872	1	4	5	17	20	26	41	11	.....
1873	2	3	4	14	22	35	37	16	1
1874	1	2	9	9	30	39	40	25	1
1875	6	2	8	19	23	40	45	22	1
1876	4	4	4	13	25	43	49	23	.....
1877	1	2	9	12	24	50	61	22	.....
1878	4	2	7	14	41	40	53	26	1
1879	4	6	11	18	27	57	59	38	.....
1880	1	2	8	18	21	59	70	34	2
1881	1	7	11	20	36	55	70	42	2
1882	4	5	14	28	41	57	77	38	1
1883	8	4	11	19	45	56	83	49	.....
Total	50	56	144	275	467	773	920	455	13

It may be of interest to show the proportion of deaths from apoplexy and paralysis, in 1883, to the population of the different sections of the State in 1880.

PROPORTION TO POPULATION.

Bristol County	One in every 1,036 persons.
Kent County	One in every 735 persons.
Newport County	One in every 1,099 persons.
Providence County Towns	One in every 1,240 persons.
Providence City	One in every 888 persons.
Washington County	One in every 1,023 persons.
Whole State	One in every 1,005 persons.

DISEASES OF THE BRAIN.

Under the head of "Diseases of the Brain," in Table LI, there are included all those diseases returned as "Cerebral Meningitis," "Cerebritis," "Congestion," "Inflammation," and "Diseases of the Brain."

The whole number, 179, is 6 more than in the previous year.

The proportions of deaths from these causes to whole number of deaths from all causes, during each of the last six years, are as follows:

1878.	1879.	1880.	1881.	1882.	1883.
3.30 per cent.	3.72 per cent.	3.49 per cent.	3.57 per cent.	3.60 per cent.	3.40 per cent.

Of the 179 decedents, 93 were males, and 86 were females. In regard to parentage, 94 were of American, and 85 of foreign parentage.

The deaths in the different seasons of the year were as follows:

First Quarter	36	Third Quarter	52
Second Quarter	50	Fourth Quarter	41
First half	86	Last half	93
Whole number	179		

The largest number of deaths from diseases of the brain have usually occurred in the third quarter of the year.

Brain diseases occur largely in children. Of the 179 decedents from those causes, in 1883, 84 were under five years of age, and 102 were under ten years of age.

BRONCHITIS.

The number of decedents, in 1883, whose deaths were reported as having been caused by bronchitis, was 111. This is a larger number than was ever before returned in a single year.

Of the 111 decedents, 56 were males, and 55 were females; or at the rate of 101.8 males to each 100 females.

In relation to parentage, 51 were of American, and 60 of foreign parentage.

TABLE LIV.

Showing the whole number of decedents in the State from Bronchitis, with the percentage of whole number of deaths, the sex, parentage, and localities of occurrence, during each of the nineteen years from 1865 to 1883 inclusive.

YEARS.	Whole Number of Deaths.	BRONCHITIS.											
		Number of Deaths from Bronchitis.	Per cent.	SEX.		PARENTAGE.		DIVISIONS OF THE STATE.					
				Males.	Females.	American.	Foreign.	Bristol County.	Kent County.	Newport County.	Providence County Towns.	Providence City.	Washington County.
1865......	3,405	9	.27	4	5	6	3	1	......	3	......	5	......
1866......	2,970	14	.51	3	11	10	4	......	1	2	7	4	......
1867......	2,889	19	.71	8	11	10	9	1	2	1	5	10	......
1868......	2,912	20	.76	9	11	7	13	......	1	2	5	10	2
1869......	3,382	20	.65	8	12	9	11	......	......	1	4	15	......
1870......	3,238	26	.84	15	11	11	15	......	......	8	8	17	......
1871......	3,344	24	.78	10	14	11	13	......	1	1	5	17	......
1872......	4,247	25	.65	10	15	11	14	1	1	1	6	16	......
1873......	4,403	27	.64	12	15	11	16	......	......	1	7	18	1
1874......	4,229	39	.96	22	17	12	27	......	......	......	6	32	1
1875......	4,317	57	1.39	32	25	29	28	......	......	1	21	33	2
1876......	4,116	57	1.46	23	34	26	31	......	2	......	7	46	2
1877......	4,450	69	1.62	32	37	35	34	1	1	1	22	44	......
1878......	4,441	80	1.89	30	50	37	43	1	2	6	22	48	1
1879......	4,472	62	1.47	31	31	31	31	1	1	5	21	34	......
1880......	4,829	91	1.98	49	42	44	47	1	6	6	21	56	1
1881......	5,016	84	1.80	48	36	39	45	1	1	2	25	53	2
1882......	5,074	100	2.08	39	61	47	53	3	2	6	25	60	4
1883......	5,282	111	2.10	56	55	51	60	5	2	3	42	57	2
Total, 19 years...	77,016	934	1.15	441	493	437	497	16	23	43	259	575	18

Bronchitis has acquired considerable prominence as a cause of death, because of the gradually increasing number reported in the returns during the last ten years.

Remarks at some length, in relation to the reported increase and some of the causes thereof, were made in the Thirtieth Registration Report.

Fifty-six, or more than one-half of the decedents from bronchitis in 1883, were under five years of age.

CANCER.

The decedents whose deaths were reported as caused by cancer, used as a generic term, and including various kinds, and in all localities, numbered 169.

The percentage of whole number of deaths, in 1883, was 3.20; in 1882 it was 2.75; in 1881 it was 2.90; as against 2.72 in 1880, and 2.96 in 1879.

The varieties of cancer, as reported, may be found in Tables VIII and IX, on pages 25, 26, 35 and 36. They are classed in Table X as follows: Cancer in various localities, or cancer (various), 95; cancer of the breast, 21; of the stomach, 26; of the uterus, 27.

In 1883 the deaths from cancer, in the several seasons of the year, were as follows:

First Quarter	36	Third Quarter	41
Second Quarter	54	Fourth Quarter	38
First half	90	Last half	79
Whole number	169		

CHILD–BIRTH.

Under the head of "Child-birth," are included puerperal fever, puerperal convulsions, and whatever causes that can only occur as the result of child-birth.

The number reported in 1883 was 58; 46 of which were from the immediate effects of child-birth, including metritis, &c., 1 from puerperal convulsions, and 11 from puerperal fever.

Of the whole number, 26 were of American, and 32 of foreign parentage.

During the year 1883 the deaths occurred as follows:

First Quarter	8	Second Quarter	22
Third Quarter	14	Fourth Quarter	14

CHOLERA INFANTUM.

The number of deaths from cholera infantum, according to the returns for 1883, was 242.

Of the 242 decedents, 124 were males, and 118 were females; or 105 males to every 100 females.

Of parentage, 104 were of American, and 138 of foreign parentage; or 132 of foreign to every 100 of American parentage.

In proportion to the population, by the census of 1880, the deaths occurred in the different divisions of the State as follows:

Bristol County	One in every 960 persons.
Kent County	One in every 2,955 persons.
Newport County	One in every 1,099 persons.
Providence County Towns	One in every 1,057 persons.
Providence City	One in every 971 persons.
Washington County	One in every 4,499 persons.
Entire State	One in every 1,143 persons.

The following Table shows the whole number of reported deaths from cholera infantum; the sex and parentage of the decedents; and the number in each of the larger divisions of the State, in each of the last nineteen years:

TABLE LV.

YEARS.	CHOLERA INFANTUM.										
	Number of Deaths.	SEX.		PARENTAGE.		DIVISIONS OF THE STATE.					
		Males.	Females.	American.	Foreign.	Bristol County.	Kent County.	Newport County.	Providence County Towns.	Providence City.	Washington County.
1865	145	63	82	61	84	17	7	14	48	50	9
1866	110	67	43	50	60	1	7	8	39	47	8
1867	117	64	53	62	55	4	3	7	45	49	9
1868	154	85	69	66	88	13	4	12	44	70	11
1869	151	81	70	79	72	6	15	6	48	65	11
1870	213	106	107	95	118	15	15	13	69	93	8
1871	172	85	87	82	90	14	12	12	59	62	13
1872	391	195	196	167	224	16	16	21	157	151	30
1873	285	148	137	165	120	17	14	16	120	99	19
1874	265	140	125	115	150	4	12	5	84	134	26
1875	318	156	162	155	163	20	16	20	108	136	18
1876	250	131	119	105	145	5	12	29	68	124	12
1877	259	139	120	96	163	12	13	9	96	122	7
1878	168	96	72	73	95	7	14	7	64	71	5
1879	161	88	73	71	90	8	16	21	51	50	6
1880	247	123	124	109	138	13	11	10	93	100	20
1881	240	130	110	102	138	10	22	14	75	102	17
1882	325	173	152	133	192	20	11	19	132	130	13
1883	242	124	118	104	138	12	7	22	88	108	5
Total, 19 years	4,213	2,194	2,019	1,890	2,323	214	227	265	1,488	1,772	247

There have been 4,213 decedents from cholera infantum, in Rhode Island, during the last nineteen years, or a yearly average of 222.

Of these there were 108.6 male decedents to every 100 female decedents; and 123 decedents of foreign parentage to every 100 of American parentage.

CONSUMPTION.

The decedents from consumption, in Rhode Island, in 1883, numbered 766. This number is 29 larger than in 1882, and 60 larger than in 1881.

Sex.—Of these 766 decedents, 358 were males, and 408 were females; or 114 female decedents to every 100 male decedents; or 46.73 males and 53.27 females in every 100 decedents from consumption.

Parentage.—The parentage was as follows: American, 286; foreign, 480; or 168 of foreign parentage to every 100 of American; or 62.67 of foreign and 37.33 of American parentage in every 100 decedents.

During the ten years from 1872 to 1881, inclusive, the whole number of deaths from consumption, as reported, was 6,333. Of this number 2,963 were of American, and 3,370 were of foreign parentage.

The proportions were, therefore,as follows: 113.7 of foreign parentage to every 100 of American; or 46.8 of American parentage, and 53.2 of foreign in every 100 decedents.

Notwithstanding the increase of population of American parentage, the number of deaths from consumption, in that class, from year to year, has not only not increased, but has steadily diminished.

The following summary will show the number of decedents from consumption, in each class of parentage, in each of the last nine years, that is, from 1875 to 1883 inclusive:

Years.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883
American Parentage	313	316	296	296	278	287	277	272	286
Foreign Parentage	337	339	365	380	359	355	429	465	480

Season.—The months in which occurred the largest number of deaths from consumption, in 1883, were as follows: May, 79; April, 78; November, 75; December, 71. Of the least number by months there were 57 in February; 54 in August; and 51 each in July and September.

The number occurring in each of the quarterly periods, during 1883, may be found in the following summary:

First Quarter	184	Third Quarter	156
Second Quarter	219	Fourth Quarter	207
First Half	403	Second Half	363
Total	766		

Ages.—During 1883, of the 766 decedents from consumption, 250, or nearly one-third, were between the ages of 20 and 30, and 150, or nearly one-fifth, were between the ages of 30 and 40.

It will be seen that consumption is most destructive of life between the twentieth and fortieth years of age.

In order to show more concisely the relation of age to mortality from consumption, the following synopsis is presented:

	No. of Deaths.
Under 10 years of age	28
Between 10 and 20 years	84
Between 20 and 30 years	250
Between 30 and 40 years	150
Between 40 and 50 years	101
Between 50 and 70 years	114
Over 70 years	32
Not Stated	7
Total	766

Locality.—There is a very considerable difference in the proportion of deaths from consumption to the whole number of deaths from known causes, in different years in the same locality, as well as in different localities in the same year and in different years.

The following Table shows the total deaths from all reported *known causes,* with the number and percentage of deaths from consumption to the same, in each of the larger divisions of the State, and in the whole State, in each of the last seventeen years, and in the aggregate for a period of twenty years, from 1860 to 1879 inclusive:

TABLE LVI.—CONSUMPTION.—*Locality, Number and Percentage.*

COUNTIES.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	Total 20 years. 1860-1879.
BRISTOL COUNTY.																		
Total Deaths, stated causes....	144	129	165	146	150	184	173	159	162	148	201	187	141	209	203	183	197	3,144
Consumption	18	21	26	26	16	23	16	18	21	19	27	23	16	19	25	36	19	423
Percentage	12.50	16.28	15.76	17.81	10.67	12.50	8.24	11.32	12.97	12.83	13.43	12.30	11.35	9.09	12.31	19.67	9.64	13.45
KENT COUNTY.																		
Total Deaths, stated causes....	214	168	265	238	281	248	241	252	263	209	251	249	277	293	313	288	283	4,761
Consumption	56	38	50	46	63	33	42	32	43	28	42	41	38	45	36	51	39	870
Percentage..................	26.17	22.62	18.86	19.33	22.42	13.30	17.43	12.69	16.35	13.39	16.73	16.47	13.72	15.35	11.20	17.71	13.78	18.28
NEWPORT COUNTY.																		
Total Deaths, stated causes....	302	289	259	271	214	262	366	221	277	280	243	265	330	324	346	378	401	6,017
Consumption	47	43	40	37	23	29	44	26	41	45	33	31	45	34	51	46	55	857
Percentage	15.56	14.88	15.44	13.66	10.75	11.06	12.02	11.77	14.80	16.07	13.58	11.69	13.64	10.49	14.74	12.17	13.72	14.24
PROVIDENCE CO. TOWNS.																		
Total Deaths, stated causes....	902	779	912	964	989	1,331	1,389	1,217	1,230	1,110	1,391	1,308	1,233	1,437	1,451	1,509	1,656	20,385
Consumption	210	158	180	172	195	221	197	136	201	211	222	229	197	189	220	224	257	3,661
Percentage	23.28	20.29	19.74	17.84	19.72	16.73	14.18	11.42	16.34	19.01	15.96	17.51	15.98	15.35	15.16	14.83	15.52	17.95

TABLE LVI.—CONSUMPTION.—*Locality, Number and Percentage.*—Continued.

COUNTIES.	1867.	1868.	1869.	1870.	1871.	1873.	1872.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	Total 20 years. 1860–1879.
PROVIDENCE CITY.																		
Total Deaths, stated causes....	945	1,086	1,240	1,249	1,239	1,581	1,725	1,965	1,894	1,850	1,932	1,973	2,017	2,063	2,130	2,230	2,351	28,194
Consumption	189	214	210	238	185	242	230	270	297	284	294	305	293	322	344	351	364	4,649
Percentage	20.00	18.71	16.95	19.06	16.74	15.31	13.33	13.74	15.68	15.35	15.22	15.46	14.53	15.60	16.15	15.73	15.48	16.49
WASHINGTON COUNTY.																		
Total Deaths, stated causes....	187	173	241	233	222	265	292	263	284	306	240	249	220	270	226	215	208	4,513
Consumption	39	38	43	56	35	49	51	44	47	68	43	47	48	33	30	29	32	861
Percentage	20.86	21.96	17.84	24.04	15 76	18.49	17 47	16.73	16.55	22.22	17.91	18.88	21.82	12.22	13 27	13.49	15.40	19.08
WHOLE STATE.																		
Total Deaths, stated causes....	2,694	2,624	3,082	3,101	3,095	3,871	4,186	4,077	4,110	3,903	4,258	4,231	4,218	4,596	4,669	4,803	5,096	67,214
Consumption	559	512	549	475	527	597	580	529	650	655	661	676	637	642	706	737	766	11,321
Percentage	20.74	19.51	17.81	18.52	17.03	15.41	13.86	12.96	15.79	16.78	15.52	15.98	15.10	14.02	15.12	15.33	15.03	16.84

It will be seen, in Table LVI, how changeable are the numbers and percentages of deaths from consumption, in different years, in the different localities of the State.

In Bristol county the proportion in 1883, 9.64 per cent., was the smallest of any county in the State, and smaller than in any one of the last seventeen years, with two exceptions. The difference between 19.67 per cent., in 1882, and 9.64 per cent., in 1883, is quite remarkable.

In Kent county the proportion, 13.78 per cent., is smaller than usual, being but little more than two-thirds the average proportion of a period of twenty years. During the last ten years Kent county has been reporting a gradually lessening proportion of deaths from consumption.

Newport county has varied the least from year to year, in the percentage of deaths from consumption, of any locality in the State. There were, in 1883, about thirteen and three-fourths deaths from consumption in every one hundred decedents from known causes.

In Providence county towns the proportion, 15.52 per cent., is rather larger than in the previous year, but the variations have not been large during the last seven years. The larger the population the less the variation from one year to another, as a general rule.

The remarks last made, in reference to Providence county towns, will apply equally well to Providence city. The proportion, 15.48 per cent., in 1883, is about one-quarter of one per cent. smaller than in 1882, and the proportions have not largely varied during the last twelve years.

Washington county has, in years back, reported a larger proportion of deaths from consumption than any other locality in the State, with the occasional exception of Kent county, but during the last four years the proportion has diminished very considerably. The percentage in 1883, 15.40, was larger than in any one of the preceding three years.

In the whole State the proportion, 15.03 per cent., was only about one-third of one per cent. smaller than in 1882.

CONSUMPTION. PROPORTION TO POPULATION.

In the twenty-ninth and thirtieth reports on registration of births, marriages and deaths, the subject of the proportion of number of decedents from consumption, to whole number of living population, was treated at considerable length.

At this time, nearly five years since a census of the population of the State was taken, a calculation of such proportion can only be approximately correct. It is not proposed, therefore, in this report,

because of the nearness of the time in which another census of the State will be taken, to make extended remarks on that subject, giving simply the proportions for 1883, according to the population in 1880, and a summary partly from a previous report.

During the year 1883, computing the proportions on the basis of the census of 1880, the results of which it will be understood are somewhat larger than the actual population during the year would warrant, the proportions are found as follows:

1883.

Bristol County	One death from consumption in every 599 persons.
Kent County	One death from consumption in every 528 persons.
Newport County	One death from consumption in every 440 persons.
Providence County Towns	One death from consumption in every 362 persons.
Providence City	One death from consumption in every 280 persons.
Washington County	One death from consumption in every 703 persons.
State	One death from consumption in every 361 persons.

CONSUMPTION. PROPORTION BY PARENTAGE.

The proportion for 1883 may be shown in a general way as follows:

	Population, 1880.	Decedents from consumption in 1883.	Of population one in every	In every 1,000
American parentage	139,117	286	486	2.06
Foreign parentage	137,414	480	286	3.49

There were, in every 10,000 of the living population of American parentage, 20.6 deaths from consumption, and in every 10,000 of the population of foreign parentage there were 34.9 deaths from consumption.

CROUP.

There were 71 decedents from croup, in Rhode Island, in 1883. There were 77 in 1882, and 101 in 1881. As a cause of death croup has diminished in importance during the last twenty years.

Sex.—Of the 71 decedents from croup, in 1883, there were 32 males and 39 females, a proportion of 82 males to each 100 females, which is not in accordance with the rule of twenty-five years.

Parentage.—There were 33 decedents of American parentage, and 38 of foreign parentage. The proportions were in the ratio of 115 of foreign to each 100 of American parentage.

Age.—There were 12 of the decedents under one year of age, 19 of one year and under two, 28 of two years and under five, and 10 between five and ten.

Of the 71 deaths from croup, 60 occurred in Providence county.

DIARRHŒA AND DYSENTERY.

There were 182 decedents from diarrhœa and dysentery, in 1883.

Sex.—Of the 182, 86 were males, and 96 were females, or in the ratio of about 90 males to each 100 females.

Parentage.—There were, of the 182 decedents, 88 of American parentage, and 94 of foreign parentage, or a proportion of 106 of foreign parentage to every 100 of American.

Age.—There were 93 of the decedents from diarrhœa and dysentery under 5 years of age, and there were 34 over 70 years of age, leaving 55 only for all the years between 5 and 70.

Locality.—Of the 182 decedents 149 were in Providence county.

Season.—There were 111 of the deaths from diarrhœa and dysentery that occurred during the months of July, August and September.

DIPHTHERIA.

The number of deaths from diphtheria, in 1883, was 95, which is a less number than in any year since 1875.

Sex.—Of the 95 decedents 39 were males, and 56 were females, or a proportion of 143 females to each 100 males.

Parentage.—There were 45 of American, and 50 of foreign parentage, a proportion of about 47.4 of American and 52.6 of foreign in each 100 decedents.

Season.—There were 24 deaths from diphtheria in the first quarter, 19 in the second quarter, 24 in the third quarter, and 28 in the fourth quarter.

Age.—There were 58 under five years of age, and 31 between five and ten.

Locality.—Of the 95 decedents 80 were in Providence county, 7 in Kent county, 4 in Washington county, 3 in Newport county, and 1 in Bristol county.

CROUP AND DIPHTHERIA.

For the purpose of comparison of the two diseases, from year to year, the following Table will show the number of deaths and the sex of the decedents in Rhode Island, from croup and from diphtheria, in

each of the seven years from 1858 to 1864 inclusive, and also the number, the sex and the *parentage* of the decedents from croup and from diphtheria, in each of the last nineteen years, from 1865 to 1883 inclusive:

Table LVII.

Years.	Croup. Number of Deaths.	Croup. Sex. Males.	Croup. Sex. Females.	Croup. Parentage. American.	Croup. Parentage. Foreign.	Diphtheria. Number of Deaths.	Diphtheria. Sex. Males.	Diphtheria. Sex. Females.	Diphtheria. Parentage. American.	Diphtheria. Parentage. Foreign.
1858	69	35	34	......	......	6	1	5	......	......
1859	58	37	21	......	......	20	10	10	......	......
1860	57	27	30	......	......	67	24	43	......	......
1861	58	32	26	......	......	140	66	74	......	......
1862	73	34	39	......	......	81	31	50	......	......
1863	97	51	46	......	......	155	73	82	......	......
1864	105	48	57	......	......	160	67	93	......	......
1865	94	44	50	32	62	82	41	41	62	20
1866	53	26	27	22	31	64	26	38	36	28
1867	50	25	25	21	29	31	14	17	19	12
1868	30	13	17	14	16	20	8	12	11	9
1869	41	19	22	14	27	33	18	15	19	14
1870	53	29	24	25	28	33	17	16	18	15
1871	72	39	33	31	41	57	23	34	29	28
1872	66	37	29	17	49	48	24	24	35	13
1873	68	30	38	35	33	45	24	21	35	10
1874	65	39	26	38	27	59	30	29	37	22
1875	96	53	43	43	53	33	17	16	18	15
1876	102	50	52	42	60	159	77	82	69	90
1877	95	48	47	34	61	492	239	253	233	259
1878	93	45	48	43	50	435	224	211	201	234
1879	96	58	38	40	56	259	121	138	143	116
1880	66	32	34	27	39	152	73	79	75	77
1881	101	45	56	38	63	216	106	110	118	98
1882	77	41	36	32	45	101	48	53	55	46
1883	71	82	39	33	38	95	39	56	45	50
Total, 26 years	1,906	969	937	581	808	3,043	1,441	1,602	1,258	1,156

During the twenty-six years the whole number of deaths from croup was 1,906, and the number from diphtheria was 3,043.

For every 100 deaths from croup there were 159 deaths from diphtheria.

CROUP. SEX AND PARENTAGE.

The proportions of the sexes of the decedents from croup, in the aggregate of twenty-six years, were as follows: To every 100 female decedents there were 103.4 male decedents; or 51 males and 48 females in every 100 decedents.

During the nineteen years from 1865 to 1883 inclusive the decedents from croup, of American parentage, numbered 581, and of foreign parentage 808. To every 100 decedents of American parentage there were 139 of foreign parentage; or 41.8 of American and 58.2 foreign in every 100 decedents.

DIPHTHERIA. SEX AND PARENTAGE.

Of the 3,043 decedents from diphtheria, in the aggregate of twenty-six years, there were 1,441 males and 1,602 females; a proportion of 111.2 females to every 100 males; or 52.7 females and 47.3 males in every 100 decedents.

Of the parentage of the decedents from diphtheria, during the last nineteen years, 1,258 were of American, and 1,156 of foreign parentage. There were 108.8 of American to every 100 of foreign; or 52.1 of American and 47.9 of foreign parentage in every 100 decedents.

SEASON AND MORTALITY.

The influence of season, in regard to mortality from croup and diphtheria, may be seen in the following Table, taken from the last report, in which these diseases may also be compared with scarlatina, to which they bear resemblance in some respects. The Table will give the whole number of deaths in each month during the periods named, and the average monthly and quarterly percentages of deaths, from each disease:

Table LVIII.

MONTHS.	CROUP. 1853-1882.		DIPHTHERIA. 1858-1882.		SCARLATINA. 1853-1882.	
	Number of Deaths.	Per cent.	Number of Deaths.	Per cent.	Number of Deaths.	Per cent.
January	266	12.36	284	9.34	595	12.21
February	231	10.74	208	6.84	547	11.22
March	185	8.60	225	7.40	489	10.03
First Quarter	682	31.70	717	23.58	1,631	33.46
April	154	7.16	185	6.08	408	8.37
May	102	4.74	189	6.21	453	9.29
June	100	4.70	184	6.06	393	8.06
Second Quarter	356	16.60	558	18.35	1,254	25.72
July	68	3.14	160	5.01	289	5.93
August	55	2.56	188	5.90	233	4.78
September	142	6.60	281	9.13	223	4.57
Third Quarter	265	12.30	629	20.04	745	15.28
October	227	10.55	392	12.56	303	6.21
November	313	14.55	394	12.96	403	8.33
December	308	14.30	350	12.51	536	11.00
Fourth Quarter	848	39.40	1,136	38.03	1,242	25.54
Totals	2,151	100.00	3,040	100.00	4,872	100.00

FEVERS, TYPHOID, &C.

The number of decedents, whose deaths were returned as having been caused by "fever" of some form, was 258. Deaths from puerperal fever are not included. This number is largely in excess of that of any preceding year. It is 29 larger than in 1882, and 115 larger than 1881.

The term "fever" includes the following types of febrile diseases, as may be seen in Table VIII, on page 30: "fevers," 7; "bilious," 1; "intermittent," 1; "malarial," 6; "typho-malarial," 4; "remittent," 1; "typhoid," 237; "typhus," 1.

The following Table exhibits, for each of the last nineteen years, the whole number of deaths in the State; the number and the per-

centage, and the sex and parentage of the decedents from fevers, and the number in each division of the State:

TABLE LIX.

YEARS.	Whole Number of Deaths.	TYPHOID FEVER.											
		Typhoid Fever.	Per cent.	SEX.		PARENTAGE.		DIVISIONS OF THE STATE.					
				Males.	Females.	American.	Foreign.	Bristol County.	Kent County.	Newport County.	Providence County Towns.	Providence City.	Washington County.
1865......	3,405	229	6.4	114	115	149	80	8	17	22	82	79	21
1866......	2,970	150	5.0	73	77	82	68	7	5	32	54	45	7
1867......	2,889	119	4.1	60	59	84	35	9	10	17	47	31	5
1868......	2,912	84	2.9	45	39	57	27	4	5	7	30	23	15
1869......	3,382	101	3.0	53	48	79	22	7	7	1	37	33	16
1870......	3,238	153	4.7	66	87	80	73	5	11	14	57	49	17
1871......	3,344	125	3.7	60	65	69	56	2	8	10	41	51	13
1872......	4,247	179	4.2	87	92	91	88	4	12	6	75	65	17
1873......	4,403	172	3.9	73	99	113	59	4	9	9	61	56	33
1874......	4,229	117	2.8	57	60	56	61	1	10	3	37	58	8
1875......	4,317	147	3.4	73	74	90	57	1	4	6	49	69	18
1876......	4,116	126	3.0	65	61	71	55	5	9	13	44	33	22
1877......	4,450	134	3.0	63	71	65	69	8	10	8	52	44	12
1878......	4,441	150	3.4	68	82	77	73	13	15	7	62	58	14
1879......	4,472	114	2.7	47	67	63	51	4	13	6	44	40	7
1880......	4,829	158	3.4	74	84	94	64	8	12	5	66	52	15
1881......	5,016	143	2.8	74	69	74	69	4	13	14	58	41	13
1882......	5,074	229	4.7	111	118	100	129	6	11	5	56	145	6
1883......	5,282	258	4.8	146	112	117	141	9	16	10	82	134	7
Total.....	77,016	2,888	3.8	1,409	1,479	1,611	1,277	109	197	195	1,034	1,106	266

The percentage of deaths from fever, in 1883, in proportion to total mortality, was larger than in any year since 1865.

Sex.—Of the 258 decedents 146 were males, and 112 were females; or a proportion of 130 males to every 100 females.

During the period of nineteen years, 1865 to 1883 inclusive, the proportions of the sexes of the decedents from "fever," in Rhode Island, were 100.7 females to every 100 males, or about an equal number in every 100 decedents.

Parentage.—There were 117 decedents from fever, of American parentage, in 1883, and 141 of foreign parentage, a proportion of about 55 of foreign and 45 of Americans in every 100 decedents.

The following Table shows the number of decedents from fevers, in each division of ages, in each of the last nineteen years, in the State of Rhode Island :

TABLE LX.

TYPHOID FEVER.	PERIODS OF LIFE.										
YEARS.	Under 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	80 and over.	Not stated.
1865	35	18	46	54	30	14	18	7	5	2	....
1866	23	10	21	26	21	16	9	14	10	....	....
1867	17	6	23	33	12	11	8	4	2	2	1
1868	10	7	10	21	8	8	10	4	5	....	....
1869	10	8	14	28	9	7	9	8	6	2	....
1870	15	13	28	39	16	20	7	7	6	1	....
1871	13	10	20	28	18	16	9	4	5	2	....
1872	17	18	34	54	20	9	12	11	3	1	....
1873	27	12	34	31	25	13	13	7	8	2	....
1874	10	14	26	32	9	5	10	3	6	2	....
1875	23	14	19	43	18	10	10	6	4	....	....
1876	21	10	15	24	14	9	6	16	6	3	2
1877	22	13	13	36	20	8	5	7	2	2	1
1878	17	16	27	47	13	11	12	2	3	2	....
1879	19	7	14	26	15	6	3	12	8	3	1
1880	25	12	24	43	23	12	10	5	3	....	1
1881	25	9	19	27	14	11	9	12	11	4	....
1882	24	22	44	69	27	14	9	10	9	1	....
1883	36	25	46	75	31	12	11	10	8	2	2
Totals	389	244	477	746	343	212	180	149	110	31	8

Of the 2,888 decedents from fever, during the last nineteen years, 1,110 were under 20 years of age, and 1,089 were between 20 and 40 years of age. There was, therefore, about 38 per cent. of the decedents under 20 years of age, and about the same per cent. between 20 and 40, or about 76 per cent. of the whole number of decedents were under 40 years of age.

DISEASES OF THE HEART.

The number of decedents from diseases of the heart, as reported in 1883, was 325. The number is 70 more than that of 1882.

Sex.—There were 167 male decedents, and 158 female decedents; a proportion of 105.7 males to every 100 females.

Parentage.—Of the 325 decedents from diseases of the heart, in 1883, there were 159 of American parentage, and 136 of foreign, a proportion of 117 of American parentage to every 100 of foreign. This is in accordance with the invariable rule of the whole period of registration.

The following Table exhibits, for each of the last nineteen years, 1865 to 1883 inclusive, the whole number of deaths in the State; the number and percentage, and the sex and parentage of the decedents from diseases of the heart, and the number of the same in each division of the State:

Table LXI.

YEARS.	Whole Number of Deaths.	DISEASES OF THE HEART.											
		Diseases of the Heart.	Per cent.	SEX.		PARENTAGE.		DIVISIONS OF THE STATE.					
				Males.	Females.	American.	Foreign.	Bristol County.	Kent County.	Newport County.	Providence County Towns.	Providence City.	Washington County.
1865......	3,405	98	2.88	51	47	65	33	6	5	8	27	47	5
1866......	2,970	115	3.87	58	57	90	25	7	8	10	41	40	9
1867......	2,889	114	3.94	67	47	81	33	4	9	7	37	49	8
1868......	2,912	116	3.96	58	58	79	37	5	8	12	35	52	4
1869......	3,382	128	3.78	75	53	79	49	2	13	11	36	62	4
1870......	3,238	117	3.61	77	40	77	40	4	10	8	35	59	1
1871......	3,344	144	4.30	78	66	91	53	4	7	8	42	77	6
1872......	4,247	189	4.45	104	85	119	70	5	9	10	59	93	13
1873......	4,403	189	4.29	83	106	122	67	4	11	14	48	101	11
1874......	4,229	214	5.06	109	105	150	64	6	6	28	50	106	18
1875......	4,317	186	4.31	84	102	113	73	2	13	22	49	88	12
1876......	4,116	166	4.03	81	80	109	57	9	11	10	38	86	12
1877......	4,450	182	4.09	94	88	110	72	3	7	9	57	93	13
1878......	4,441	166	3.73	88	78	109	57	5	11	15	38	83	14
1879......	4,472	202	4.78	114	88	127	75	8	20	16	38	111	9
1880......	4,829	231	5.03	125	106	146	85	9	21	29	59	104	9
1881... ..	5,016	264	5.65	131	133	154	110	9	21	24	73	121	16
1882......	5,074	255	5.31	116	139	162	93	8	16	23	55	142	11
1883......	5,282	325	6.20	167	158	159	136	8	27	30	70	172	18
Total, 19 years...	77,016	3,401	4.42	1,765	1,636	2,142	1,229	108	233	284	887	1,686	193

Sex.—Of the 3,401 persons deceased from diseases of the heart, in the last nineteen years, 1,765 were males, and 1,636 were females; or 107.8 males to each 100 females.

Parentage.—The remarkable difference in the proportion of deaths from diseases of the heart, in the American and foreign parentage, in the above Table, will scarcely fail to be noticed.

Of the 3,401 decedents, during nineteen years, 2,142 were of Amercan parentage, and 1,229 of foreign.

The proportions would therefore stand as follows:

To every 100 of foreign parentage there were about 174 of American; or 63 American, and 37 of foreign parentage in each 100 deaths.

The following Table shows the number of decedents from diseases of the heart, in each divisional period of life, in each of the last nineteen years:

TABLE LXII.

YEARS.	Under 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	80 and over.	Not stated.
1865	14	4	6	7	22	17	19	9	......
1866	18	8	14	17	10	23	21	4	......
1867	11	11	10	13	22	16	27	4	......
1868	15	5	13	11	14	28	25	5	......
1869	21	4	14	18	20	22	21	7	1
1870	19	6	11	13	20	21	23	3	1
1871	9	12	10	19	23	36	28	6	1
1872	27	12	22	19	31	36	29	13	......
1873	19	11	28	18	25	35	42	9	2
1874	20	16	26	21	27	50	40	12	2
1875	14	16	25	20	32	29	41	9	......
1876	14	10	15	19	20	38	39	10	1
1877	15	11	20	18	27	45	33	13	......
1878	16	8	18	16	26	36	35	11	......
1879	19	9	13	25	33	51	36	16	......
1880	15	10	18	23	38	49	49	28	1
1881	32	13	26	23	37	49	53	21	......
1882	22	17	24	25	36	51	61	17	2
1883	39	13	21	33	52	65	76	26	......
Total	359	196	334	368	515	697	698	223	11

The results of nineteen years of registration, with record of ages of decedents from diseases of the heart, show in periods of twenty years of life, the following percentages:

Under 20 years of age	10.7 per cent.
Between 20 and 40	15.8 per cent.
Between 40 and 60	26.2 per cent.
Between 60 and 80	41.6 per cent.
Over 80	5.7 per cent.
	100.0 per cent.

It will be seen that nearly one-half of all the deaths from diseases of the heart were of persons over sixty years of age.

Diseases of the heart have acquired large importance as a cause of death. From 2.88 per cent. of all causes of death, in 1865, heart diseases have gradually increased to 6.20 per cent., in 1883.

PNEUMONIA.

There were 400 decedents from pneumonia, in 1883. The number is 56 larger than in 1882, and has been equalled in but one year previously, that is, in 1875.

In 1875, however, the proportion to whole number of deaths was 9.3 in every hundred, and in 1883 it was 7.5 in every hundred.

Sex.—Of the 400 decedents from pneumonia, and including congestion of the lungs, 192 were males, and 208 were females; or 92.3 males to each 100 females.

Parentage.—By parentage there were 198 of American, and 202 of foreign parentage. The proportions of decedents from pneumonia were 98 of American to each 100 of foreign parentage.

Season.—There were 216, or more than one-half, of the deaths occurred during the first four months of the year. The largest mortality was 61 in March, and 60 in April.

The following Table shows, for each of the last nineteen years, the whole number of deaths reported in Rhode Island; the number and the percentage, with the sex and the parentage of the decedents from pneumonia, and the number in each year, in each division of the State:

TABLE LXIII.

YEARS.	Whole Number of Deaths.	PNEUMONIA.											
		Pneumonia.	Per cent.	SEX.		PARENTAGE.		DIVISIONS OF THE STATE.					
				Males.	Females.	American.	Foreign.	Bristol County.	Kent County.	Newport County.	Providence County Towns.	Providence City.	Washington County.
1865......	3,405	175	5.1	80	95	110	65	8	11	21	49	74	12
1866......	2,970	193	6.5	94	99	127	66	13	17	13	59	81	10
1867......	2,889	172	5.9	68	104	103	69	8	12	12	56	68	16
1868......	2,912	191	6.6	99	92	120	71	9	5	16	54	92	15
1869......	3,382	190	5.6	104	86	110	80	7	10	10	63	88	12
1870......	3,238	182	5.6	102	80	96	86	6	12	15	55	78	16
1871......	3,344	218	6.5	104	114	129	89	12	21	11	68	85	21
1872......	4,247	229	5.4	119	110	125	104	11	1	9	74	120	14
1873......	4,403	234	5.3	127	107	143	91	11	9	10	65	123	16
1874......	4,229	250	5.9	118	132	143	107	6	13	7	73	136	15
1875......	4,317	400*	9.3	199	201	243	157	14	27	25	105	198	31
1876......	4,116	339	8.2	164	175	162	177	13	23	16	97	163	27
1877......	4,450	226	5.1	104	122	127	99	10	7	14	81	98	16
1878......	4,441	317	7.1	143	174	176	141	10	11	18	110	140	28
1879......	4,472	311	7.4	148	163	163	148	7	15	15	103	156	15
1880......	4,829	364	7.9	180	184	177	187	26	16	18	92	192	20
1881......	5,016	327	6.5	177	150	190	137	10	23	17	81	174	22
1882......	5,074	344	7.2	178	166	163	181	10	22	24	91	176	21
1883......	5,282	400	7.8	192	208	198	202	19	21	34	108	204	14
Totals, 19 years...	77,016	5,062	6.5	2,500	2,562	2,805	2,257	210	276	305	1,484	2,446	341

Pneumonia as a cause of death has increased considerably, during the last nineteen years, but the increase has not been nearly as large, in proportion to whole number of deaths, as apoplexy or bronchitis.

Sex.—The results of nineteen years of registration do not show any marked difference in the number of male and female decedents, the proportions standing at 102.4 females to each 100 males.

Parentage.—The results in regard to parentage are widely different. The proportions are 124.2 of American parentage to every 100 of foreign parentage.

Table LXIV.

Exhibiting the number of decedents from pneumonia, in each of the several periods of life, during each of the last nineteen years, from 1865 to 1883 inclusive.

YEARS.	Under 5.	5 to 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	80 and over.	Not stated.
1865	65	4	2	....	14	11	15	17	21	21	5	....
1866	57	4	4	5	12	10	14	21	25	32	9	....
1867	57	9	2	3	10	11	13	16	25	13	12	1
1868	70	4	3	3	15	8	16	13	19	27	13	....
1869	64	11	1	2	11	12	9	28	25	16	11	....
1870	84	6	5	4	6	7	8	14	20	19	8	1
1871	71	7	2	7	10	17	16	16	35	17	19	1
1872	83	5	1	7	17	20	19	22	24	19	11	1
1873	105	4	8	3	10	14	16	17	24	23	10	....
1874	76	9	4	6	17	17	25	21	40	27	8	....
1875	120	9	3	8	22	30	35	39	61	43	28	2
1876	116	5	4	3	20	20	32	35	48	39	17	....
1877	79	2	....	7	15	15	24	27	22	24	9	2
1878	115	9	4	10	14	17	28	20	42	45	13	....
1879	102	8	1	3	14	27	26	35	38	38	9	....
1880	95	18	3	16	14	33	37	46	47	43	12	....
1881	102	4	2	5	15	22	26	45	48	31	26	1
1882	71	3	4	14	22	36	49	33	41	46	21	4
1883	88	15	2	13	32	33	40	53	49	46	27	2
Totals	1620	136	55	119	290	360	448	518	654	569	278	15

Age.—Of the 5,062 decedents from pneumonia, during the period of nineteen years, 1,620, or nearly one-third, were under five years of age. During the period of life of over fifty years of age the number of decedents was 2,019, or about 40 per cent. of the whole number.

The following summary will present the percentages in round numbers:

Under five years of age	32 per cent.
Five years and under twenty	6 per cent.
Twenty years and under fifty	22 per cent.
Fifty years and over	40 per cent.

SCARLATINA.

The number of deaths returned as having been caused by scarlatina, in 1883, was 34.

There is no disease that has varied so much from year to year, as a cause of death, in its proportion to whole number of deaths, as scarlatina.

In 1880 the decedents from scarlatina numbered 468. In 1867 the number was 14.

Sex.—Of the 34 decedents from scarlatina, 17 were males, and 17 were females.

Parentage.—There were 14 of American parentage, and 20 of foreign; or a proportion of 144 of foreign parentage to every 100 of American.

During a period of nineteen years there were 1,401 decedents from scarlatina, of American parentage, and 1,627 decedents of foreign; or a proportion of 116 of foreign to each 100 of American parentage.

The following Table will present the statistics of scarlatina for each of the last twenty-nine years, from 1855 to 1883 inclusive, the whole number of deaths in the State during that period, the number and percentage and sex of the decedents from scarlatina, and the number from scarlatina in each division of the State. It also shows, from 1865 to 1883 inclusive, the parentage of the decedents from scarlatina :

Table LXV.

YEARS.	Whole Number of Deaths.	SCARLATINA.											
		Scarlatina.	Per cent.	SEX.		PARENTAGE.		DIVISIONS OF THE STATE.					
				Males.	Females.	American.	Foreign.	Bristol County.	Kent County.	Newport County.	Providence County Towns.	Providence City.	Washington County.
1855......	1,846	71	3.8	41	30	......	......	22	......	1	6	42	......
1856......	2,042	208	10.2	109	99	......	......	3	1	3	57	144	......
1857......	2,325	147	6.3	69	78	......	......	......	20	47	47	32	1
1858......	2,616	234	8.9	118	116	......	......	5	11	75	61	72	10
1859......	2,270	71	3.1	34	37	......	......	5	2	4	14	45	1
1860	2,686	64	2.4	31	33	......	......	4	3	7	17	17	16
1861......	2,927	67	1.9	24	33	......	......	2	2	7	9	28	9
1862......	2,591	47	1.8	25	22	......	......	3	4	3	19	14	4
1863......	3,207	91	2.8	40	51	......	......	1	......	23	24	33	10
1864......	3,360	266	8.0	120	146	......	......	1	19	19	80	141	6
1865......	3,405	255	7.5	130	125	134	121	33	17	3	86	108	8
1866......	2,970	28	0.9	15	13	12	16	5	......	8	12	3	......
1867......	2,889	14	0.5	6	8	10	4	1	......	1	2	10	......
1868......	2,912	93	3.2	47	46	32	61	2	3	3	34	50	1
1869......	3,382	286	8.4	126	160	128	158	17	23	12	72	138	34
1870......	3,238	75	2.3	37	38	28	47	1	6	3	22	35	8
1871......	3,344	66	1.9	41	25	31	35	1	3	1	37	21	13
1872......	4,247	53	1.2	22	31	22	31	......	1	4	27	19	2
1873......	4,403	287	6.5	124	163	163	124	4	2	42	80	132	27
1874......	4,229	462	10.9	231	231	176	296	27	17	1	133	268	16
1875......	4,317	185	4.3	85	100	121	64	8	30	3	35	94	15
1876......	4,116	80	1.9	34	46	42	38	3	2	7	21	35	12
1877......	4,450	62	1.4	26	36	29	33	14	4	3	21	12	8
1878......	4,441	86	1.9	41	45	35	51	3	5	3	14	57	4
1879......	4,472	311	7.4	164	147	130	181	3	6	4	37	255	6
1880......	4,829	468	10.0	215	253	216	252	22	30	11	143	243	19
1881......	5,016	138	3.0	79	59	62	76	11	25	12	41	45	4
1882......	5,074	45	0.9	24	21	16	29	......	3	16	7	18	1
1883......	5,282	34	0.6	17	17	14	20	1	1	5	9	16	2
Total.....	102886	4,284	4.6	2,075	2,209	*1,401	*1,627	202	230	331	1,157	2,127	227

* Nineteen years.

COMPARATIVE RESULTS.

The following Table presents concisely the percentage of *total mortality* from *specified* causes of death, resulting from twenty-three *prominent* causes, as reported in 1883 in the whole State, and in the several divisions of the State:

Table LXV.

Causes of Death.	Bristol County.	Kent County.	Newport County Towns.	Newport City.	Providence County Towns.	Providence City.	Washington County.	Whole State. 1883.
Accidents (all kinds).........	2.02	2.80	1.00	2.70	3.78	2.84	1.44	2.84
Apoplexy and Paralysis......	5.50	9.88	6.30	5.17	4.50	5.09	10.08	5.39
Brain, Diseases of...........	4.06	4.59	2.70	3 44	3.12	3.80	1.92	3.30
Bronchitis..................	2.50	.70	....	1.03	2.52	2.46	.96	2.04
Cancer..........	1.50	6.00	2.70	3.11	3.00	3.72	3.36	3.30
Cholera Infantum............	6.08	2.47	1.80	6.92	5.28	4.69	2.40	4.73
Consumption.................	9.60	13.80	7.20	16.26	15.42	15.68	15.36	15.01
Convulsions.................	2.50	3.88	1.80	1.37	2.46	2.68	.48	2.47
Croup.....	.50	2.11	1.80	.70	1.50	1.51	....	1.40
Debility*....................	1.50	.35	2.70	2.76	2.04	.22	3.36	1.14
Diarrhœa....................	1 50	.70	1.80	2.40	3.36	2.33	.48	2.55
Diphtheria..................	.50	2.47	.90	.70	1.56	2.54	1.92	1.88
Dysentery..........	2.00	1.76	3.50	1.03	1.20	.69	.96	1.06
Fevers......................	5.00	5.65	3.50	2.41	5.12	5.75	3.34	5.12
Heart, Diseases of.....	4.00	9.53	9.80	6.57	4.20	7.42	8.64	6.35
Hooping Cough...............	.50	....	....	....	.24	.17	.48	.17
Hydrocephalus...............	1.50	....	....	....	.54	1.38	....	.87
Kidneys, Diseases of.........	2.50	.70	4.70	4.15	2.22	2.59	3.84	2.43
Liver, Diseases of...........	2.50	1.40	....	1.38	.78	.73	.96	.83
Marasmus........	1.00	....	....	.70	2.88	2.23	....	2.02
Old Age......................	8.50	6.35	13.40	10.03	5.46	3.62	10.08	5.22
Pneumonia.....	9.50	7.39	10.70	7.61	6.48	8.79	6.72	7.84
Scarlatina...................	.50	.35	.90	1.40	.54	.69	.96	.64

The five leading causes of death in 1883, in the different localities of the State, are as follows, in the order as named:

In Bristol county, consumption, pneumonia, old age, cholera infantum, apoplexy.

In Kent county, consumption, apoplexy, diseases of the heart, pneumonia, old age.

* Not infantile.

Newport county towns, old age, pneumonia, diseases of the heart, consumption, apoplexy.

Newport city, consumption, old age, pneumonia, cholera infantum, diseases of the heart.

Providence county towns, consumption, pneumonia, old age, cholera infantum, fevers.

Providence city, consumption, pneumonia, diseases of the heart, fevers, apoplexy.

Washington county, consumption, old age, apoplexy, diseases of the heart, pneumonia.

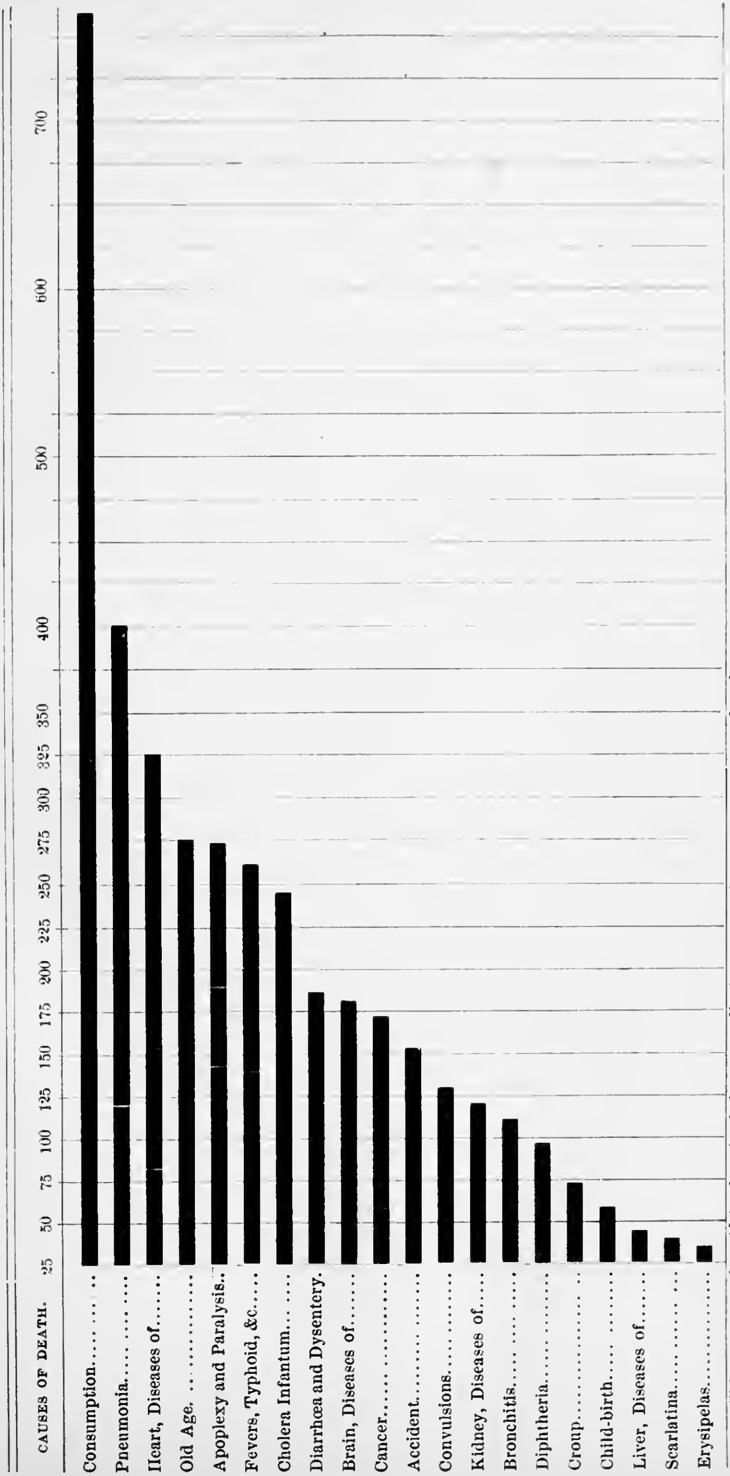
Whole State, consumption, pneumonia, diseases of the heart, old age, apoplexy.

The following Table shows the percentages of several prominent causes of death, in the aggregate of total mortality from specified causes in Rhode Island, during a period of eight years, from 1876 to 1883 inclusive :

TABLE LXVI.

CAUSES OF DEATH.	YEARS.							
	1883.	1882.	1881.	1880.	1879.	1878.	1877.	1876.
Accidents (all kinds).........	2.84	3.44	3.04	3.51	2.43	2.89	3.10	2.94
Apoplexy and Paralysis......	5.39	5.52	5.23	4.67	5.21	4.45	4.25	4.22
Brain, Diseases of...........	3.50	3.60	3.84	3.44	3.73	3.28	3.68	3.75
Bronchitis..................	2.04	2.08	1.80	1.98	1.47	1.89	1.62	1.46
Cancer......................	3.30	2.75	3.11	2.72	2.96	2.82	3.17	2.72
Cholera Infantum......... ..	4.73	6.77	5.15	5.43	3.81	3.97	6.08	6.41
Consumption	15.01	15.33	15.12	14.02	15.09	15.98	15.52	16.78
Convulsions and Fits	2.47	2.29	2.18	2.88	2.47	2.65	1.95	2.28
Croup	1.40	1.60	2.16	1.45	2.28	2.20	2.23	2.61
Debility	1.14	2.69	2.61	3.09	2.35	1.91	2.65	2.80
Diarrhœa........	2.55	1.87	1.65	1.52	1.26	1.25	2.11	1.87
Diphtheria..................	1.88	2.10	4.63	3.40	6.14	10.28	11.56	4.07
Dysentery	1.06	1.42	.90	.61	1.04	.95	1.22	1.28
Fevers......................	5.12	4.60	3.05	3.37	2.70	3.94	3.55	3.69
Heart, Diseases of	6.35	5.31	5.68	5.03	4.78	3.92	4.28	4.25
Hooping Cough.............	.17	1.48	1.46	.44	1.02	1.28	.75	1.23
Hydrocephalus	.87	1.02	1.20	1.01	1.36	1.65	1.29	1.74
Kidneys, Diseases of.........	2.43	1.79	1.69	2.02	1.88	1.89	1.57	1.28
Liver, Diseases of...........	.83	1.21	.82	1.20	1.17	1.06	1.06	1.13
Marasmus	2.02	1.62	1.11	1.27	1.16	1.30	.99	1.13
Old Age	5.22	5.89	5.29	5.95	5.22	5.25	5.00	6.18
Pneumonia	7.84	7.16	7.01	7.90	7.37	7.49	5.31	8.69
Scarlatina	.64	.94	2.96	9.99	7.37	2.03	1.46	2.05

Diagram III. Exhibiting the comparative mortality by absolute number of decedents, from twenty principal causes of death in Rhode Island, in 1883.



It will be seen that the width of each of the perpendicular spaces represents twenty-five decedents

NOMENCLATURE OF DISEASES,

OR

CAUSES OF DEATH.

NAMES OF CAUSES OF DEATH.

It should be stated that the nomenclature of diseases in the nosological arrangement on the following pages is not intended to include the names of the whole list of morbid phenomena affecting the human organism, but the names of such only as are directly the **cause of death**, or such as ordinarily predispose to, or set in motion the morbid processes that end in death.

In the construction of the classification now adopted, use has been made of the results and conclusions of a committee of the Royal College of Physicians, of England (who have been engaged for several years in a revision of the British nomenclature of diseases), as far as such conclusions have been ascertained from brief reports in different medical journals, and from such other sources as were accessible (the complete report not having yet been issued), and from examination of the classifications in use in different countries in Europe and America.

It should be said that all these classifications have been and are **essentially alike**, that all have been based designedly on observed facts and most advanced conclusions in relation to pathological processes and morbid conditions, inductive, causative, progressive and ultimate.

The statistical nosology will consist of two lists of causes of death,

A TABULAR LIST AND SUPPLEMENTAL LIST.

The Tabular List comprises the chief or primary causes of death which will be used in Table X on Classification and Percentage in the preparation of the Registrar's Annual reports, and will, therefore, include all those named in the Supplemental List, when the final arrangement is completed.

The Supplemental List is subordinate to the Tabular List, and contains synonyms, or names of related diseases, which may be actually, or are supposed to be, causes of death, and which are in addition to those in the Tabular List, and which are often found in Physician's **certificates of death**, as reported to the State Registrar. These will all have a place, in alphabetical order, in Tables VIII and IX in the Reports, and will be variously grouped under different heads in Table X, as the figure which precedes each cause in the Supplemental List will correspond with the figure of the head in the Tabular List under which that cause is placed.

NOMENCLATURE OF CAUSES OF DEATH.

CLASSES.

I. General Diseases.—A.	SPECIFIC AND FEBRILE.	(*Zymotic.*)
II. General Diseases.—B.	CACHECTIC.	(*Constitutional.*)
III. Special Diseases. —A.	FUNCTIONAL OR ORGANIC.	(*Local.*)
IV. Special Diseases. —B.	DEVELOPMENTAL.	(*Developmental.*)
V. Violent Deaths. —	FROM INJURIES.	(*Violence.*)

SUB GROUPS OR ORDERS.

CLASS I.—**Zymotic Diseases.**

ORDER ONE, Miasmatic. ORDER TWO, Enthetic. ORDER THREE, Dietic. ORDER FOUR, Parasitic.

CLASS II.—**Constitutional Diseases.**

ORDER ONE, Diathetic. ORDER TWO, Tubercular.

CLASS III.—**Local Diseases.**

ORDER ONE, Diseases of the Nervous System. ORDER TWO, Organs of Circulation. ORDER THREE, Organs of Respiration. ORDER FOUR, Organs of Digestion. ORDER FIVE, Urinary Organs. ORDER SIX, Reproductive Organs. ORDER SEVEN, Osseous and Locomotory Organs. ORDER EIGHT, Integumentary System.

CLASS IV.—**Developmental Diseases.**

ORDER ONE, Of Children. ORDER TWO, Of Women. ORDER THREE, Of Old Age. ORDER FOUR, Of Nutrition.

CLASS V.—**Violent Deaths.**

ORDER ONE, Accidents and Negligence. ORDER TWO, Homicide. ORDER THREE, Suicide.

STATISTICAL NOSOLOGY.

CLASS I.—Zymotic Diseases.

TABULAR LIST.

For Table X of the Registration Report.

ORDER One.—Miasmatic.

I. One.—1. Carbuncle . . . . .
2. Cholera, Asiatic . . . .
3. Cholera, Sporadic . . . .
4. Cholera Infantum . . . .
5. Cholera Morbus . . . .
6. Croup (Pseudo Membranous) .
7. Diphtheria . . . . .
8. Diarrhœa . . . . .
9. Dysentery . . . . .
10. Erysipelas . . . . .
11. Fever, Bilious . . . . .
12. Fever, Cerebro Spinal . .
13. Fever, Intermittent . .
14. Fever, Malarial . . . .
15. Fever, Typhoid . . . .
16. Fever, Typho-Malarial . .
17. Fever, Unspecified . . .
18. Fever, Yellow . . . . .
19. Influenza (Epidemic . .
20. Measles . . . . . .
21. Mumps . . . . . .
22. Metria (Puerperal Fever) .
23. Pertussis . . . . . .
24. Tonsillitis . . . . .
25. Scarlatina . . . . .
26. Small Pox . . . . .
27. Varicella . . . . . .

ORDER Two.—Enthetic.

I. Two.—1. Glanders . . . . . .
2. Gonorrhea . . . . .
3. Hydrophobia . . . . .
4. Malignant Pustule . . .
5. Septicæmia . . . . .
6. Syphilis . . . . . .

ORDER Three.—Dietic.

I. Three.—1. Alcoholism . . . . .
2. Delirium Tremens . . .
3. Inanition . . . . . .
4. Purpura and Scurvy . .

ORDER Four.—Parasitic.

I. Four.—1. Apthæ . . . . . .
2. Worms . . . . . .
3. Other Parasites . . . .

SUPPLEMENTAL LIST.

Synonyms or Related Diseases.

ORDER One.—Miasmatic.

I. One.—1. Anthrax.
Gangrenous Boil.
4. Entero Colitis, Gastro Ente itis, } Infantile.
10. Hospital Gangrene.
Pyemia.
Phagadena.
Phlegmon.
15. Infantile Fever.
Typhus Fever.
20. Rothein.
21. Parotitis.
22. Child-bed Fever.
23. Hooping Cough.
24. Quinsy.
25. Scarlet Fever.
Angina Maligna.
26. Varioloid.
27. Chicken Pox.
Miliaria.

ORDER Two.—Enthetic.

I. Two.—2. Stricture of the Urethra.
Gonorrheal Opthalmia.
5. Necusia.

ORDER Three.—Dietic.

I. Three.—1. Intemperance.
3. Privation.
Starvation.
Neglect.

ORDER Four.—Parasitic.

I. Four.—1. Thrush.
2. Tape Worm.
Trichianasis.
3. Scabies.
Hydatids.
Porrigo, Favus, etc.

CAUSES OF DEATH.

CLASS II.—Constitutional Diseases.

TABULAR LIST.	SUPPLEMENTAL LIST.
Order One.—Diathetic.	
II. One.—1. Gout	II. One.—2. Anasarca.
2. Dropsy	3. Leucocythæmia.
3. Anæmia	Chlorosis.
4. Cancer, Various	4. Soft Cancer.
5. Cancer of Breast	Epithelioma.
6. Cancer of Stomach	Melanosis.
7. Cancer of Uterus	Lupus.
8. Noma (Canker)	Other kinds of Cancer.
9. Mortification	9. Bed-sore.
10. Rheumatism	Dry Gangrene.
	10. Rheumatic Carditis.
	Rheumatic Synovitis.
	Rheumatic Meningitis.
Order Two.—Tubercular.	
II. Two.—1. Scrofula	II. Two.—1. Psoas (Lumbar) Abscess.
2. Tabes Mesenterica	White Swelling.
3. Phthisis (Pulmonary)	Cretinism (Goitre).
4. Hydrocephalus	Adenetis.
5. Tubercular Meningitis	Morbus Coxarius.
	Pott's Disease.
	2. Tubercular Peritonitis.
	3. Hæmoptysis.

CLASS III.—Local Diseases.

TABULAR LIST.	SUPPLEMENTAL LIST.
Order One.—Nervous System.	
III. One.—1. Cephalitis	III. One.—1. Phrenitis.
2. Cerebritis	Meningitis.
3. Apoplexy	Cerebro Spinal Meningitis. (Sporadic.)
4. Paralysis	5. Monomania.
5. Insanity	Fright.
6. Chorea	Grief.
7. Epilepsy	Melancholia.
8. Tetanus	Dementia.
9. Convulsions	Rage.
10. *Brain Diseases**	6. Hysteria.
	8. Laryngismus.
	Lockjaw.
	Trismus Nascentium.
	10. Neuralgia, Cerebral.
	Neurasthenia
	Disease of Spinal Cord.
	Necrencephalus (Ramollissement).
	Thrombosis, Cerebral.
Order Two.—Circulatory System.	
III. Two.—1. Pericarditis	III. Two.—1. Carditis.
2. Aneurism	Endocarditis.
3. *Heart Diseases**	3. Hypertrophia.
	Atrophia.
	Angina Pectoris.
	Syncope.
	Arteritis.
	Ossification of Arteries.
	Phlebitis.
	Hydropericardium.
	Embolus.
	Thrombosis.

* Not otherwise placed.

STATISTICAL NOSOLOGY.

CLASS III.—Local Diseases.—Continued.

TABULAR LIST.

ORDER Three.—Respiratory System.

III. Three.—1. Epistaxis
2. Laryngitis
3. Bronchitis, Acute
4. Bronchitis, Chronic
5. Pleurisy
6. Pneumonia
7. Asthma
8. *Lung Diseases**

ORDER Four.—Digestive System.

III. Four.—1. Gastritis
2. Enteritis
3. Peritonitis
4. Ascites
5. Ulceration of Intestines
6. Hernia
7. Ileus
8. Intussusception
9. Stricture of Intestines
10. Fistula
11. *Stomach Diseases**
12. *Pancreas Diseases**
13. Hepatitis
14. Jaundice
15. *Liver Diseases**
16. *Spleen Diseases**
17. *Bowel Diseases**

ORDER Five.—Urinary System.

III Five.—1. Nephritis
2. Ischuria
3. Nephria (Bright's Disease)
4. Diabetes
5. Calculus (Gravel, &c.)
6. Cystitis
7. Prostate, Disease of
8. *Kidney Diseases**
9. Bladder, Diseases of*
10. Testicles, Disease of

ORDER Six.—Generative System.

FEMALE.

III. Six.—1. Ovarian Dropsy
2. *Diseases of Uterus**

SUPPLEMENTAL LIST.

III. Three.—2. Œdema Glottidis.
5. Empyema.
Diaphragmitis.
Pneumothorax.
Hydrothorax.
6. Pulmonary Apoplexy.
Hæmoptysis.†
Congestion of Lungs.
7. Grinders' Asthma.
Miners' Asthma.
Emphysema.

III. Four.—1. Glossitis.
Stomatitis.
Pharyngitis.
Œsophagitis.
2. Gastro Enteritis. } Not Infantile.
Entero Colitis.
5. Perforation of—
6. Congenital.
" Femoral.
Inguinal.
Scrotal.
Umbilical.
Ventral.
7. Constipation.
Obstipation.
Perityphlitis.
Typhlitis.
9. Strict Œsophagus.
11. Dyspepsia.
Pyrosis.
Gastralgia.
Hæmatemesis.
Melæna.
14. Gall-stones.
15. Cirrhosis.

III. Five.—3. Albuminuria.
6. Cystirrhœa.
8. Diuresis.
Hæmaturia.
Uræmia.
9. Urethritis.
10. Orchitis.

III. Six.—1. Ovarian Tumor.
2. Hysteritis, Metritis.
Uterine Uteri.
Polypus Tumor.
Ovaritis.
Pelvic Cellulitis.

* Not otherwise placed. † See Class II. Order Two—3, Sup. List.

CAUSES OF DEATH.

CLASS III.—Local Diseases.—Continued.

TABULAR LIST.	SUPPLEMENTAL LIST.
ORDER Seven.—**Osseous and Locomotory System.**	
III. Seven.—1. Bones, Diseases of	III. Seven.—1. Ostitis. Periostitis. Fragilitas Ossium. Mollities Ossium. Rickets. Caries, Necrosis. Exostosis.
2. *Joint Diseases**	2. Synovitis. Hip Disease.†
3. Vertebræ, Diseases of	3. Spine Disease. Spine, Caries and Necrosis.
ORDER Eight.—**Integumentary System.**	
III. Eight.—1. Phlegmon‡	III. Eight.—1. Abscess, part not stated. Boil. Whitlow.
2. Ulcer	
3. *Skin Diseases**	3. Roseola. Urticaria. Eczema. Herpes. Pemphigus. Ecthyma. Impetigo. Psoriasis, &c. Dermatitis (from burns, &c.).
ORDER Nine.—**Organs of Special Sense.**	
EYE AND EAR.	
III. Nine.—1. Malignus Oculi	
2. Opthalmitis	
3. Ossis Petrosis	
4. Otitis	

CLASS IV.—Developmental Diseases.

ORDER One.—**Developmental Diseases of Children.**	
IV. One.—1. Still-born	
2. Debility, Infantile	IV. One.—2. Asthenia.
3. Debility, Premature Birth	
4. Cyanosis	4. Atelectasis Pulmonum.
5. Spina Bifida	
6. Other Malformations	6. Anus Imperforatus. Cleft Palate. Idiocy.
7. Teething	
8. Innutrition	8. Malnutrition.

* Not otherwise placed. † See Class II, Order Two—1, Sup. ‡ See Class I, Order One—10, Sup.

STATISTICAL NOSOLOGY.

CLASS IV.—Developmental Diseases.—Continued.

TABULAR LIST.

ORDER Two.—Developmental Diseases of Women.

IV. Two.—1. Paramenia . . . . .
2. Childbirth* . . . . .

ORDER Three.—Developmental Diseases of Old People.

IV. Three.—1. Old Age . . . . .

ORDER Four.—Diseases of Nutrition. Adolescent and Adult.

IV. Four.—1. Atrophy . . . . .
2. Debility . . . . .

SUPPLEMENTAL LIST.

IV. Two.—1. Amenorrhœa.
Chlorosis.†
Climacteria.
Menorrhagia.
2. Miscarriage.
Abortion.
Puerperal Mania.
Puerperal Convulsions.
Phlegmasia Dolens.
Cæsarian Operation.
Extra-uterine Fœtation.
Flooding.
Retention of Placenta.
Presentation of Placenta.
Deformed Pelvis
Mammary Abscess.

IV. Four.—1. Marasmus.
Malnutrition.
2. Asthenia.
Exhaustion.

CLASS V.—Violent Deaths.

ORDER One.—Accident or Negligence

V. One.—1. Fractures and Contusions .
2. Wounds, Unspecified . .
3. Burns and Scalds . . .
4. Poison . . . . . .
5. Drowning . . . . .
6. Suffocation . . . . .
7. Various. . . . . .

ORDER Two.—Homicide.

ORDER Three.—Suicide.

V. Three.—1. Wounds, Unspecified . .
Wounds, Pistol or Gunshot .
Wounds, Knife . . . .
2. Poison . . . . . .
3. Drowning . . . . .
4. Hanging . . . . .
5. Otherwise . . . . .

ORDER Four.—Various.

V. Four.—1. Unclassified . . . .
2. Cause not specified . .

V. One.—1. Railroad and other Accidents.
5. Lost at Sea.
6. Asphyxia.
Strangulation.
7. Exposure.
Co d Water.
Frozen.
Heat.
Lightning.
Surgical Operation.

V. Two.—1. Infanticide.
Patricide.
Matricide.
Fratricide.
Filicide, &c.

* See Class I, Order One—22, Tab. List.

† See Class II, Order One—3, Sup.

Suggestions concerning physicians' certificates of death. It should be the endeavor to specify the causes of death as definitely and correctly as possible. It is not unusual to find a return of death with the physician's certificate, naming the cause of death, "Paralysis," "Paraplegia," "Fits," "Convulsions," "Dropsy," &c., which are merely secondary or consecutive causes, simply symptoms only, or results of some organic lesion or pathological derangement. Sometimes **the alleged cause** is really the *final cause,* as in a case of termination of life by paralysis, but the cause given as paralysis **is not the determining cause.** Apoplexy, or some lesion of the nervous centres, must be the original and determining cause of paralysis, paraplegia, hemiplegia, &c., and the determining cause should be stated as the primary in the return or certificate.

Convulsions are the symptoms or results of some antecedent or concurrent disease. They follow meningitis and other structural lesions of the nervous centres : they also occur from reflex derangement or disturbance of the nervous centres, as in children, from intestinal irritation, or from inflammation, as in gastritis, enteritis, nephritis, &c. In such cases they may be contributory to death, and perhaps, in rare instances, a final cause, by inducing or taking the form of tonic or tetanic spasm. But as contributory, or as a final cause, they are simply concomitant, and are not unfrequently manifestations of the desperate efforts of expiring vitality to regain original and normal control. They should find place as secondary causes only in certificates of death.

"Fits" is too unmeaning a term to be used in any case. The word in a medical sense literally means an attack, an occurrence, or succession of attacks of some physical or mental disturbance, as "fits of sickness," "fits of melancholy, &c.," and is not properly used as synonymous with convulsions from any cause. It would be just as sensible to attribute a death to an "occurrence" or an "attack" as a cause, as to "fits," without other qualification.

"Dropsy" and "Ascites" have been allowed to stand as determining causes of death because of extended use, and because of the obscurity with which their causes in rare instances are involved. We can scarcely conceive of a dropsical accumulation without antecedent organic or functional disorder, derangement of the absorbent or secretory system, or depravation of the blood. They are left in the tabular list with not a little reluctance. Paralysis is also left in the tabular list for a like reason, and with the same doubt of propriety.

It may be suggested that it is sometimes difficult, and occasionally impossible, to ascertain positively the chief or leading cause of

death. The physician last in attendance may find several functional or structural diseases, the morbid conditions multiple and complex, and not only the initial derangement, but the succession of morbid processes, proximate, consecutive and ultimate, inextricably entangled and lost to discovery.

The careful diagnostician will, however, even then be able to *conceive the probable leading cause,* but, whether or not, he will be able at least **to ascertain the most prominent and controlling lesion or functional derangement then existing,** and which may reasonably be accepted as the primary cause of death.

The preceding remark applies very properly to cases of adventitious diseases which prove fatal, when occurring in individuals already suffering from some chronic disease of slower progress, as when fatal dysentery attacks a consumptive person, or one having chronic nephritis dies from pneumonia. **The acute disease** occurring independently of the chronic disease **is the chief cause of death,** although the fatal event may have been made more sure by the existence of the antecedent disease, and although the antecedent disease would have ultimately caused death.

In attributing death to scrofula, tuberculosis, tumor, cancer and other generic terms as causes, the **organic structure or locality where the disease is developed** should always be given, otherwise such terms are very indefinite, and discredit the acquirements of the certifying physician.

The objects desired in presenting the preceding nomenclature of causes of death, and the suggestions following, are to subserve the purpose of greater uniformity in the use of nosological terms, and to promote the accomplishment of entire definiteness, accuracy, and completeness in the physicians' certificates of causes of death.

The returns of deaths in Rhode Island have been from year to year acquiring greater completeness. The improvement, however, has been **greater in relation to every other fact** connected with the events of death **than with the fact of cause.** This defect in large measure is the result of disregard of the statute law on the part of the individuals having the decedents in charge, before and after death, both medical and mortuary.

The State of Rhode Island has a leading reputation for the extent and completeness of its vital statistics. It is not excelled, if equalled, by any State in the Union. With the exception of two or three, there are no States that have approximate completeness of numbers of decedents, and fullness of statements of fact connected therewith. It is hoped that the physicians of Rhode Island will feel a professional and patriotic interest in the further elevation of the reputation of the State as a collector of accurate and complete vital statistics.

THE LAWS OF RHODE ISLAND

IN RELATION TO

Vital Statistics, the State Board of Health, Marriage and Divorce.

PUBLIC STATUTES, CHAPTER 85.

OF THE REGISTRATION OF BIRTHS, DEATHS AND MARRIAGES.

SECTION 1. The town clerks of the several towns, or any person whom the board of aldermen of any city, or the town council of any town may appoint for that purpose, shall obtain, chronologically record and index, as required by the forms prescribed by section three of this chapter, all information concerning births, marriages and deaths occurring among the inhabitants of their respective towns; and on or before the first Monday in March, annually, shall make duly certified returns thereof to the secretary of the state board of health for the years ending on the thirty-first day of December next preceding, accompanying the same with a list of the persons required by law to make returns to them, who have neglected to do so, and with such remarks relating to the object of this chapter as they may deem important to communicate.

SEC. 2. The secretary of the state board of health shall receive the returns made in pursuance of the preceding section, and annually make a general abstract and report thereof, in form as prescribed by section three of this chapter, and publish not exceeding one thousand copies thereof. Said returns, after such report is prepared, shall be deposited in the office of the secretary of State, who shall cause the same to be arranged, full alphabetical indices of all the names to be made, and the whole to be bound in volumes of convenient size, and carefully preserved in his office.

SEC. 3. The blank forms required to carry out the provisions of this chapter shall, on application, be furnished by the secretary of the state board of health, to clergymen, physicians, undertakers, town clerks, clerks of meetings of the

Society of Friends and other persons requiring them, substantially as follows: The record of a birth shall state the date and place of birth, name and sex of the child, whether born alive or still-born, the name and surname, color, occupation, residence and birthplace of the parents, and the time of recording, so far as the same can be ascertained. The record of a marriage shall state the date of the marriage, place, name, residence and official station of the person by whom married, names and surnames of the parties, age, color, occupation and residence of each, condition, that is whether single or widowed, what marriage, that is whether first, second, third or other marriage, the occupation, birthplace and name of their parents, and the time of recording, so far as the same can be ascertained. The record of deaths shall state the date of death, name and surname of deceased, the sex, color and condition, whether single or married, age, occupation, place of death, place of birth, names and birthplace of parents, disease or cause of death, and the time of recording, so far as can be ascertained.

Sec. 4. Every meeting of the Society of Friends, clergyman, and all others authorized to join persons in marriage, shall make a faithful record of every such rite performed by them, in manner and form aforesaid, and return the same for the last preceding month, on or before the second Monday of every month, to the town clerk of the town in which such rite shall have been performed; and no marriage shall be solemnized until the parties shall have signed and delivered to the person about to solemnize it, or to the clerk of a meeting of the Society of Friends, a certificate containing the information required for the record of a marriage, as prescribed by this chapter.

Sec. 5. The town clerk of every town shall annually, in the month of January, collect the information required by this chapter, in relation to all children born in the town during the year ending on the thirty-first day of December next preceding.

Sec. 6. Whenever any person shall die, or any still-born child shall be brought forth in this state, the physician attending at such bringing forth or last sickness, if any physician so attended, shall within forty-eight hours after such death or bringing forth, leave with the family, if any, or person having the care of the deceased, or the person bringing forth such still-born child, or give to the undertaker or person who conducts the funeral, a certificate stating, in case of a death, the name of the deceased, the date of the death, and the disease or cause of the death, and in case of the bringing forth of a still-born child, the date and the cause of such child being brought forth still-born.

Sec. 7. Every town council may appoint a sufficient number of persons to act as undertakers, removable at the pleasure of such council.

Sec. 8. No undertaker or other person shall conduct a funeral, or bury or deposit in a tomb, or remove from this state, or otherwise dispose of the remains of any deceased person or still-born child, unless he shall first obtain the physician's certificate required by section six of this chapter, if a physician was in attendance upon such person who has deceased, or the person bringing forth such still-

born child, and shall return the same, together with his own certificate of the information required by section three of this chapter, to the town clerk of the town where such death or bringing forth took place.

Sec. 9. Any town may make ordinances more effectually to attain the objects herein contemplated.

Sec. 10. The town clerks, or persons appointed as aforesaid, shall receive for each record of a death made and returned as required by law, and for each record of a marriage made and returned as required by law, twenty cents, to be paid to them out of their respective town treasuries: *Provided*, that the yearly compensation to be paid out of the town treasury as aforesaid, to any one town clerk or person appointed as aforesaid, who shall perform the duties prescribed by this chapter, shall not be less than five dollars. Undertakers and others making returns of deaths as required by section eight of this chapter, shall receive for each full report of a death made to the town clerk, five cents, in the cities of Providence and Newport, and ten cents in the other towns of the state.

Sec. 11. Every clergyman, physician, undertaker, town clerk, clerk of any meeting of the Society of Friends, or other person, who shall wilfully neglect or refuse to perform any of the duties imposed on, or required of him, by this chapter, shall be fined not exceeding twenty dollars for each offence, one-half thereof to the use of the town in which the offence shall occur, and one-half thereof to the use of the person who shall complain of the same.

Sec. 12. Every clergyman, physician, coroner, undertaker or clerk of any meeting of the Society of Friends, shall cause his name and residence to be recorded in the town clerk's office of the town where he resides.

Sec. 13. No letters of administration or letters testamentary shall be granted by any court of probate, upon the estate of any person, until the death of such person, or the facts from which the same is presumed, shall be duly certified, as near as may be, to the town clerk, in order that the same may be duly registered according to the provisions of this chapter.

Sec. 14. The town clerks of the several towns, the city clerk of the city of Newport, and the city registrar of the city of Providence, shall have the custody of all records of births, deaths and marriages of their respective towns, whether made under the statutes now in force or any former statute, and a certificate signed by them, certifying that any written or printed statement of any marriage, birth or death is a true copy of the record in their custody, shall be admitted as evidence of such marriage, birth or death.

Sec. 15. Births, marriages and deaths of non-residents shall be distinguished from those of residents, in the returns, by being arranged separately.

Sec. 16. The secretary of the state board of health may, from time to time, vary the forms of returns, and require such additional information as he may consider necessary to accomplish the object of this chapter.

Sec. 17. The town clerks or other officers appointed under this chapter to collect, record and return the births in the several towns, shall receive fees therefor

as follows: For making record and return of these facts as required by law, twenty cents each for the first fifty entries in each calendar year, and ten cents each for each subsequent entry and return; to be paid by the town in which the birth is recorded.

SEC. 18. The town clerks of the several towns, or other persons appointed under this chapter to collect the births in the several towns, shall annually in the month of January, collect the facts concerning the births within their respective towns, required by this chapter; and shall, so far as practicable, at the same time collect the names of all persons liable to be enrolled in the militia, as required by title thirty-four; and the census of all persons between the ages of five and fifteen years inclusive, as provided by chapter fifty; and shall receive therefor such compensation as the town council or the board of aldermen of their respective towns or cities shall determine: *Provided*, that the city of Providence shall be exempt from so much of the provisions of this section as relates to the collection of the statistics of births.

SEC. 19. Blanks for the foregoing purposes shall be furnished, on application therefor, on or before the first day of December in the year preceding, by the state board of health for the collection of births, by the adjutant-general for the taking of the enrolled militia, and by the commissioner of public schools for the census aforesaid.

SEC. 20. The person or persons who shall discharge the duties required by section eighteen of this chapter, if other than the town clerk, shall make full return thereof to the town clerk of his or their town, on or before the tenth day of February next following.

SEC. 21. The returns required to be made by clerks of the supreme court, in relation to divorces, to the secretary of the state board of health, or a prepared abstract thereof, shall be published in the annual report on the births, marriages and deaths in the state.

CHAPTER 83.

OF THE STATE BOARD OF HEALTH.

SECTION 1. The governor, with the advice and consent of the senate, shall appoint six persons, two from the county of Providence, and one from each of the other counties, who shall constitute the state board of health, one of whom shall be appointed in each year for the term of six years from the first day of July. Any appointment to fill a vacancy shall be for the remainder of the term. Of the persons so appointed at least three shall be well educated physicians, and members of some medical society incorporated by the state. The governor may remove any member, for cause, at any time, upon the written request of two-thirds of the board.

Sec. 2. The board shall take cognizance of the interests of life and health among the citizens of the state. They shall make investigations into the causes of disease, and especially of epidemics and endemics among the people, the sources of mortality, and the effects of localities, employments, conditions and circumstances on the public health, and shall faithfully do all in their power to ascertain the causes and the best means for the prevention of diseases of every kind in the state. They shall publish and circulate, from time to time, such information as they may deem to be important and useful for diffusion among the people of the state, and shall investigate and give advice in relation to such subjects relating to the public health as may be referred to them by the general assembly, or by the governor when the general assembly is not in session.

Sec. 3. The state board of health shall also investigate the subject of diseases among cattle or other animals.

Sec. 4. The board shall meet in the city of Providence once in three months, and as much oftener as they may deem necessary. No member of the board, except the secretary, shall receive any compensation for his services; but the actual personal expenses of any member, while engaged in the duties of the board, shall be paid by the state.

Sec. 5. The board shall elect a well qualified physician as their secretary, who shall be *ex-officio* a member of the board, the commissioner of public health, and state registrar, but he shall not be permitted to vote on any question in which he is personally interested, or be entitled to any additional compensation for mileage or expenses.

Sec. 6. The secretary of the said board shall make inquiry from time to time, of the clerks of town and local boards of health, and practicing physicians, in relation to the prevalence of any disease, or knowledge of any known or generally believed source of disease, or causes of general ill-health, and also in relation to the proceedings of the said boards of health in respect to acts for the promotion and protection of the public health, and also in relation to diseases among domestic animals in their several towns and localities respectively; and the said clerks of town and local boards of health, and the said practicing physicians, shall give such information, in reply to said inquiries, of such facts and circumstances as shall have come to their knowledge.

Sec. 7. The secretary shall perform and superintend the work prescribed for said board by law, and such other duties as the board may require, and he shall receive such salary, not in excess of twelve hundred dollars annually, as the board may determine. He shall hold his office during the pleasure of the board, and may be removed at any regular meeting, by a majority vote of the members thereof.

Sec. 8. The governor shall provide a suitable office for the board in the city of Providence, and the actual expenses of the board and of the members thereof, when certified by the chairman and approved by the governor, shall be paid from the state treasury.

SEC. 9. The board shall make a report in print to the general assembly, annually, of its proceedings during the year ending on the thirty-first day of December next preceding, with such suggestions in relation to the sanitary laws and interests of the state as they shall deem important.

SYNOPSIS OF THE LAW OF MARRIAGE.

CHAPTER 163 PUBLIC STATUTES.

SECTIONS 1, 2 and 3 show what kindred persons cannot marry, and declare marriages within prohibited degrees null and void.

SECTION 4 makes an exception in favor of Jews, within the degrees of affinity or consanguinity allowed by their religion.

SECTION 5 declares the marriage of persons having a husband or wife living, and of idiots or of lunatics, absolutely void.

SEC. 6. "Any ordained minister or elder of any religious denomination, who shall be *domiciled* in this state, and either justice of the supreme court, may join persons in marriage in any town of the state." (It will be seen that clergymen from other states *cannot* LAWFULLY *solemnize marriages* in Rhode Island.)

SECTION 7 defines what shall be understood by the term "religious denomination," within the meaning of the preceding section.

SEC. 8. Wardens in the town of New Shoreham may join persons in marriage in said town.

SECTION 9 provides that no minister, elder, magistrate or warden shall join persons in marriage, unless such persons, ***if residents of this state,*** shall first present (to the clergyman or other persons officiating) a certificate properly executed and signed by the town or city clerk or city registrar of the town or city in which ***EACH of such persons shall RESPECTIVELY reside,*** and ***if not residents of this state,*** then from the town or city clerk or registrar of *the town or city in which the marriage shall be solemnized*, to the effect that the said town or city clerk or registrar has ***duly recorded the intention*** of marriage between the parties named in the certificate, the said certificate also setting forth the names and surnames of the parties, the age, color, occupation, birthplace and residence of each, whether either or both have been before married, and if before married, whether the marriage intended is the first, second, third or other marriage, and also whether the condition of either or both persons previously married is that of a divorced person, and the names, occupation and birthplace of each of their parents; and no town or city clerk or city registrar shall issue such certificate to any minor or person under guardianship, unless the consent in writing of the parent or guardian shall have been first obtained thereto,

provided, however, such certificate may be issued to a female over eighteen years of age, who has no parent or guardian living in the United States. (The legal minority of both sexes terminates at the age of twenty-one.)

SECTION 10 provides that every Society of Friends, and *every person* authorized to join persons in marriage *shall certify* upon the certificate required in section nine of this chapter *the time when* and *the place where* the marriage shall have been solemnized by him, and SHALL *on or before the second Monday of every month*, return the certificate of every marriage solemnized by him during the last preceding month, to the *clerk or registrar* of the TOWN OR CITY *in which such rite shall have been performed.*

SECTION 11 forbids the solemnization of the marriage ceremony, by any person, when lawful objection is made thereto in writing, until such lawful objection be removed.

SECTIONS 12 and 13 provide that any person who shall join persons in marriage without first receiving the certificate required in section nine of this chapter, or otherwise contrary to, or in violation of, chapter 163 of the Public Statutes, shall be imprisoned not exceeding six months, or fined not exceeding one thousand dollars.

SECTION 14 provides that ALL PERSONS married without duly proceeding as required by chapter 163, shall be fined not exceeding fifty dollars.

SEC. 15. The solemnization of marriage shall be in the presence of two witnesses at least, besides the minister, elder or magistrate officiating.

SECTION 16 relates to marriages among Quakers or Friends, and among Jews, making them valid if in accordance with the forms, rites and ceremonies of the same respectively.

SECTION 17 provides that at least one of the parties to any marriage solemnized according to the manner and form of the Society of Friends, or rites and ceremonies of the Jewish religion shall, before the celebration thereof, sign and deliver to the town or city clerk or city registrar of the town or city in which such marriage is solemnized, the certificate required in section nine.

CHAPTER 167.

OF DIVORCE.

SECTION 1. Divorces from the bond of marriage shall be decreed in case of any marriage originally void or voidable by law, and in case either party is for crime deemed to be or treated as if civilly dead, or, from absence or other circumstances, may be presumed to be naturally dead.

SEC. 2. Divorces shall be decreed for impotency, adultery, extreme cruelty, wilful desertion for five years of either of the parties, or for such desertion for a

shorter period of time in the discretion of the court, for continued drunkenness, for neglect or refusal on the part of the husband, being of sufficient ability, to provide necessaries for the subsistence of his wife; and for any other gross misbehavior and wickedness in either of the parties, repugnant to, and in violation of, the marriage covenant.

SEC. 3. Whenever it shall appear that the absence, adultery, cruelty, desertion or other cause of complaint, as aforesaid, was committed or occasioned by the collusion of the parties, and done or contrived with an intention to procure a divorce, in such case no divorce shall be decreed.

SEC. 4. Whenever a divorce shall be had for the causes of affinity, consanguinity, impotency, idiocy, lunacy, or crime of either of the parties, the wife shall have restored to her all her lands, tenements and hereditaments; and a judgment may be passed for a restoration to her of all or such part of the personal estate specifically, or the value thereof, which has come to the husband's hands by virtue of the marriage, as the court from the circumstances of the case shall deem equitable.

SEC. 5. Whenever the divorce shall be occasioned by adultery, or other of the causes aforesaid, done or committed on the part of the wife, the husband shall hold the personal estate not secured to her by law, forever, and her real estate not secured to her by law, during his natural life, in case they have had issue born alive of her body during the marriage, otherwise during her natural life only, if he shall survive her.

SEC. 6. The court may, in such case, allow the wife for her subsistence so much of her real and personal estate as they shall deem necessary or proper.

SEC. 7. Whenever a divorce is granted for adultery, or crime on the part of the husband, the wife shall be entitled to dower in the same manner as if he were dead, unless the court shall decree alimony, chargeable upon the estate of the husband, instead of such dower.

SEC. 8. Whenever a divorce shall be had for adultery, or for any of the causes aforesaid, done or committed on the part of the husband, the wife shall continue to hold all her property, real and personal, secured to her by law, free from any right in, or control over, her disposition of the same, either during her life or at her death: and, if there be no issue living, shall be restored to all other her lands, tenements and hereditaments, if any there be.

SEC. 9. In such case the wife shall also be allowed out of the real or personal estate of the husband, or out of both, such alimony as the court shall think reasonable, not exceeding the use of one moiety of his real estate, during the life of the wife, and the property of one-half of his personal estate, having regard to the personal property which came to the husband by the marriage, and his ability.

SEC. 10. If there be issue living at the time of the divorce, the court, with regard to ordering restoration to the wife of such of her lands, tenements, or hereditaments, if any, as may not be secured to her by law, and in regard to the

amount of alimony to be allowed to her out of the property of the husband, may do as they shall judge the circumstances of the case may require.

Sec. 11. Divorces from bed, board, and future cohabitation, until the parties be reconciled, may be granted for any of the causes for which by law a divorce from the bond of marriage may be decreed, and for such other causes as may seem to require the same.

Sec. 12. In case of such divorce, the court may assign to the petitioner a separate maintenance out of the estate or property of the husband or wife, as the case may be, in such manner, and of such amount, as they may think necessary or proper.

Sec. 13. Every petition shall be signed by the petitioner, if of sound mind and of legal age to consent to marriage, otherwise, upon application to the court, and after notice to the party in whose name the petition shall be filed, the court may allow such petition to be signed by a guardian or next friend.

Sec. 14. All jurisdiction over divorce, alimony, separate maintenance, or the custody, education, and support of the children of persons divorced or petitioning for a divorce, is vested in the supreme court.

Sec. 15. Said court shall have no cognizance of, or jurisdiction over any petition for the same, or either of the same, unless the petitioner shall, at the time of preferring such petition, be a domiciled inhabitant of this state, and have resided therein for the period of one year, next before the preferring of such petition.

Sec. 16. All such petitions shall be filed, heard, and tried in the county in which the petitioner shall reside.

Sec. 17. The said court may, by general rule or otherwise, prescribe the notice to be given, within or without the state, on such petitions, and may issue such process as may be necessary to carry into effect all powers conferred upon them in relation to the same.

Sections 18, 19 and 20 contain provisions in relation to citations to adverse party residing without the state, or in parts unknown.

Sec. 21. Whenever any citation, issued under the provisions of this chapter, shall be served by a disinterested person, such person shall return the same, having made oath thereon of the place where, the time when, and the manner in which he shall have made service of the said citation.

Section 22 provides for giving and ensuring proper and sufficient notice to the adverse party.

Sec. 23. The said court is empowered to regulate the custody, and provide for the education, maintenance and support of the children of all persons by them divorced or petitioning for a divorce, and of all persons to whom a separate maintenance may be granted, or who may petition for the same; to make such allowance to the wife, out of the estate of her husband, for the purpose of enabling her to prosecute or defend against any such petition for divorce or separate maintenance, in case she has no property of her own, available for such purpose,

as they may think reasonable and proper; and to make all necessary orders and decrees concerning the same, and the same at any time to alter, amend and annul for sufficient cause, after notice to the parties interested therein.

SEC. 24. The said court may authorize a married woman to whom a divorce from the bond of marriage is decreed to change her name, with the same rights and liabilities as if her name had not been changed.

SEC. 25. After the filing and during the pendency of any petition under this chapter, the supreme court may, as in equity, make such interlocutory decrees, or grant such temporary injunctions as may be necessary, until a hearing can be had before the court.

CHAPTER 198.

OF DIVORCES.

SECTION 5. The clerks of the supreme court in the several counties shall make returns to the secretary of the state board of health, on or before the first day of March, in each and every year, for the year ending on the thirty-first day of December preceding, of all the applications for divorce, showing the number, the number granted, and the causes which are given for the application, but without the names of the parties, in accordance with the blanks which shall be furnished them by the secretary of the state board of health.

SECRETARY'S REPORT

TO THE

BOARD

FOR THE YEAR

1884.

ANNUAL REPORTS ON PREVALENT ACUTE DISEASES.

The State of Rhode Island during the year 1884, has been unusually and quite singularly exempt from the epidemic prevalence of contagious and infectious diseases. Those of usual occurrence have appeared sporadically in a considerable number of towns with lessened virulence, and in a few towns with larger prevalence and severer form.

CROUP.

Inflammatory croup or cynanche trachealis, though not usually regarded as an infectious disease, has had a quite varied prevalence in Rhode Island during the last twenty-five years. Making three periods of eight years each, preceding 1883, there was in the first period an average of 74.4 decedents from croup, in each year, in the second period an average of 56.9 decedents, and in the third period an average of 90.7 decedents. In proportion to the population there was in the first period about 4.1 in every 10,000, in the second period about 2.6 in every 10,000, and in the third period about 3.2 in every 10,000.

The number of decedents might not represent exactly the proportional number of cases in each period, but there is no disease in which the proportion of fatal cases to whole number of cases, is more nearly uniform than that of inflammatory croup.

It will be seen that the disease has had periods of increase and subsidence. During 1884 it has not been reported as having large prevalence in any part of the State, except that section including the towns of Cumberland, Lincoln and Pawtucket. Elsewhere the prevalence has been below the average.

DIPHTHERIA.

No epidemic prevalence of diphtheria has occurred during the year in any town in the State. In the later months of the year there was

a rather more than average number in the towns of Coventry and Warwick, and a rather large prevalence in Cumberland and Lincoln. In all other towns, it either had small average or no occurrence, or occurred sporadically in greatly diminished numbers.

MALARIAL DISEASES.

The various forms of disease having a malarial origin, have had a large prevalence during the year, somewhat diminished in numbers in localities where they had a first appearance in 1880, but with average numbers in territory invaded during the following two or three years, and an increased and increasing number in sections newly invaded.

Reports give a somewhat lessened prevalence in Barrington, Westerly and South Providence, where such large numbers occurred in past years. The same may be said of the whole of Washington county, and Kent county with the exception of a part of Warwick. Newport county has been almost entirely exempt. The city of Newport has not reported a single case originating there.

In Providence county diseases of a malarial character have largely prevailed in Cranston, Johnston, Pawtucket, Lincoln, Cumberland and Woonsocket. In Providence city and East Providence the number has been about an average with the previous year.

MEASLES.

There has been a large prevalence of measles, amounting to almost epidemic proportions, in Natick and vicinity in the town of Warwick, in New Shoreham and in a section of Little Compton. The disease has also prevailed largely in a part of Foster, and quite largely in Pawtucket and a part of Lincoln.

In Providence city the prevalence has been rather larger than in the previous two years, but the form has been very mild. In a few other sections small prevalence has been reported, but in a majority of the towns the disease has appeared in very small numbers or had no occurrence.

SCARLATINA.

Scarlatina was epidemic in Westerly in the closing months of the year, occurring in its most severe forms, and continuing into the year 1885. It was also largely prevalent in Newport city and Pawtucket but in a very mild form. Scattered cases occurred in Providence

city all through the year and also in adjoining towns, but in September and October the cases increased so rapidly as to suggest the probability of an epidemic. The number sick at one time did not, however, very largely increase, and although a much larger number occurred than during any year since 1880, the form was very mild, and the fatal cases few in proportion to the whole number.

There were a considerable number of cases in East Greenwich and Scituate, and a few in Coventry, Warwick, Lincoln and Woonsocket.

TYPHOID FEVER.

A limited epidemic of typhoid fever occurred in Burrillville during the Fall months, and with that exception no occurrence of the disease approaching an epidemic occurred in any part of the State. But few towns reported an average number, and it may be said that the State in 1884 was unusually free from cases of typhoid fever.

WHOOPING COUGH.

There was a sharp epidemic of whooping cough in Plainville and adjoining parts of Hopkinton and Charlestown during the later summer months, and in a rather severe form. It was epidemic also in Cumberland. There was also quite a large prevalence in Providence city and vicinity during the summer months and early in the fall. The disease also occurred largely in Newport city, Westerly, Pawtucket and vicinity, and in the towns of Warren and Foster. Elsewhere in small numbers or not at all.

The following table will show the degrees of prevalence of twelve important diseases, in the different towns in Rhode Island, during the year 1884.

Relative prevalence of twelve important diseases during 1884.

TOWNS.	Bronchitis.	Cholera Infantum.	Croup.	Diphtheria.	Diarrhea and Dysentery.	Fever, Typhoid.	Fever, Malarial.	Measles.	Pneumonia.	Rheumatism.	Scarlatina.	Whooping Cough.
Barrington	=	=	=	0	=	—	+	—	+	=	0	—
Bristol	=	—	—	0	—	+	—	0	—	—	—	—
Warren	=	=	—	0	=	=	=	+	+	+	0	+
Coventry	=	=	—	=	+	—	..	—	+	+	—	..
East Greenwich	=	=	—	—	=	=	—	0	=	=	=	=
West Greenwich	=	—	=	..	—	—	0	0	=	+	=	—
Warwick	+	=	+	—	—	—	=	*	=	=	..	—
Jamestown	=	—	0	0	—	—	0	0	—	—	0	—
Little Compton	—	—	0	..	—	=	0	*	—	—	0	=
Middletown	=	—	0	..	—	=	0	—	=	0	=	—
New Shoreham	—	—	0	—	—	+	0	*	—	—	0	0
Portsmouth	=	—	0	0	—	—	0	0	—	—	—	..
Tiverton	=	—	0	..	—	—	0	—	=	=	—	..
Newport City	=	—	..	..	—	=	..	—	=	=	+	+
Burrillville	—	—	—	=	=	*	0	0	+	=	+	0
Cranston	=	=	—	—	—	=	+	—	=	+	=	—

Cumberland	+	—	+	+	—	—	*	..	—	=	=	*
East Providence	=	=	—	=	—	+	=	—	+	+	=	—
Foster	—	—	..	..	—	—	..	+	=	=	0	..
Glocester	—	—	..	=	=	=	0	0	+	=	=	0
Johnston	=	+	—	—	—	=	+	—	=	=	+	—
Lincoln	=	=	—	=	=	—	+	..	—	—	=	=
North Providence	=	—	..	=	—	=	+	—	+	+	—	0
North Smithfield	=	=	—	..	=	=	—	0	=	+	—	0
Pawtucket	=	—	+	+	=	=	+	+	—	—	+	=
Scituate	=	=	—	—	—	=	+	—	+	+	+	0
Smithfield	=	=	—	—	=	=	+	0	=	+	=	..
Woonsocket	=	=	—	..	=	+	+	0	=	+	+	0
Providence City	=	+	=	=	—	—	=	=	+	+	+	=
Charlestown	=	—	..	—	+	—	—	0	—	—	..	+
Exeter	=	—	—	..	—	—	0	0	—	+	—	0
Hopkinton	=	—	..	—	=	=	—	0	—	=	—	+
North Kingstown	=	=	—	—	=	=	—	0	—	=	=	—
South Kingstown	=	=	—	..	=	=	..	0	+	+	—	0
Richmond	=	—	..	—	+	=	—	0	—	=	..	*
Westerly	=	..	—	..	=	—	=	0	+	=	*	+

☞ The signs or characters used in the above Table, indicate the degrees of prevalence of the diseases named, as follows: The * indicates an epidemic prevalence; the sign + a large prevalence; the sign = a moderate prevalence; the sign — a small prevalence; the dots a *very* small prevalence, and the 0 no prevalence according to the returns.

MONTHLY REPORT OF DISEASES.

During the five years previous to 1884, the plan of calling for monthly reports of the most prevalent acute diseases by practising physicians who were the regular correspondents of the Board, were continued without interruption.

These reports were originally designed to present also many other circumstances in connection with the diseases reported, that is, the conditions of the atmosphere as to humidity and temperature, the conditions of the soil, and deeper earthy strata, the sanitary conditions of occupied premises, and many others which are believed to have more or less influence in the causation and continuance of many kinds of diseases, as well as degree of severity and consequent mortality.

But the complex character of the returns thus desired, deterred much the larger number of correspondents from making any report whatever. A simpler form was then adopted, and continued as stated above, throughout the remainder of the period.

The last form will be of some value in the ascertainment of what diseases the different towns are most liable to the prevalence of, and the difference in the degree of severity and continuance of, and also possibly some enlightenment in regard to the laws which govern the causation and migration of the contagious and infectious zymotic diseases.

In regard to the original design, it seems to be a foregone conclusion, however desirable it may have been and however unpleasant the evident fact, that the difficulties in the way of its accomplishment are, at least at the present, insurmountable.

It is the design, however, to continue in the effort of obtaining, at least, reports of diseases prevailing in the several towns, especially such as seldom occur, and also the contagious and infectious diseases when largely prevailing, and important diseases of common occurrence, when very prevalent and of large fatality.

In accordance with the latter design, the blank form of postal card return has been modified somewhat and now reads as follows :

RETURN OF DISEASES in ....

and vicinity, during the month of 188

This Card is designed for reporting the large prevalence of any important disease, and the prevalence of any disease of importance of ***unusual*** occurrence. In the column "Form or Severity" the letter *m* following the name of a disease will signify "mild," the letter *a* "average," the letter *s* "severe," and the letters *Ep.* "epidemic." In the column of "General Sickness" (other than named), the sign — will signify less than usual, the letter *a*, an average, and the sign + more than usual. Ordinary diseases of ordinary prevalence need not be specially reported. When the last postal blank is used, make a cross on the lower left hand corner of the card.

DISEASES.	Form or Severity.	General Sickness.
Bronchitis........		
Cholera Infantum..		
Cholera Morbus....		
Croup Membranous		
Diphtheria........		
Diarrhea..........		
Dysentery..... ...		
Fever Typhoid....		
Fever Malarial		
Fever, Cerebo-Spi'l.		
Measles....		
Pneumonia........		
Rheumatism.......		
Scarlatina.........		
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....*M. D.*

ANNUAL REPORTS OF MEDICAL CORRESPONDENTS

The plan of obtaining from the regular medical correspondents of the Board, and other physicians, as in previous years, of a report at the commencement of each year, covering, in a general way, the whole of the preceding year, in relation to the amount of sickness of all kinds, the prevalence of particular diseases, and sanitary conditions and movements in their respective localities, has been continued and the following circular sent therefor as usual.

CIRCULAR NO. 29.

Office of Secretary of the State Board of Health.

Providence, Jan. 1, 1885.

The Secretary of the State Board of Health desires to obtain from all respectable physicians in every section of the State an Annual Report covering the whole twelve months preceding the above date.

The following questions will indicate the information sought, and the general plan of such report; but correspondents need not be confined to precise replies to the questions presented, all the freedom being allowable of such modifications and additions as the circumstances or peculiarities of each locality may seem to warrant.

These annual reports are desired for the purpose of presenting the status of the public health and the sanitary conditions and sentiment existing in the different sections of the State, during the year 1884, in the Seventh Annual Report of the State Board of Health.

They should be returned to the Secretary of the Board by the second week in February.

Any additional postage stamps needed to cover postage on more extended consideration of the topics suggested, or any other topic having relation to the public health, will be immediately refunded on the receipt of papers.

QUESTIONS.

1. Name of Physician. M. D.

2. Name of town and circuit.

3. Taking sickness of all kinds, has there been more or less than usual in your circuit the past year. How much?

4. Which of the following zymotic diseases have prevailed in your circuit during the past year? Please state when sporadic and when epidemic, whether mild, average or severe, and in what months they occurred, and in what localities ?

a. Cholera Infantum.

b. Croup.

c. Diarrhea and Dysentery.

d. Diphtheria.

e. Fever, Malarial

f. Fever, Typhoid

g. Measles.

h. Scarlatina.

i. Small Pox.

j. Whooping Cough.

5. Any other zymotic disease becoming epidemic.

Also, please state what degree of prevalence, whether large, average or small, and if above average, in what months was the large occurrence, of the following named diseases. State degree of prevalence and time of occurrence under the headings following:

	Degree of PREVALENCE.	MONTHS.
k. Brain, Inflammation and Congestion of.		
l. Bronchitis, Acute		
m. Meningitis, Cerebro Spinal		
n. Pneumonia.		
o. Rheumatism.		
p. Stomach, Acute Diseases of		

6. What diseases, not classed as zymotics, have had unusually large prevalence during the past year?

7. What diseases have been attended with unusual fatality.

8. Have any circumstances occurred within your observation or knowledge that seemed to indicate that Scarlet Fever, Diphtheria or Typhoid Fever had been taken or communicated from one person to another? A full history of known facts in detail should be given. Such history need not be confined to any particular year. State on separate sheet.

9. Has there been, in your opinion, any advance in public sentiment or views of individuals, in your circuit, in regard to the importance of sanitary surround-

ings; or any increased interest in means of preventing diseases? State what reasons for belief.

Very respectfully,

CHAS. H. FISHER,

Sec. of State Board of Health.

The following extract from the Public Statutes in relation to the duties of town and local boards of health and practicing physicians, was also appended:

PUBLIC STATUTES, CHAPTER 83.

SEC. 6. The secretary of the said board shall make inquiry from time to time, of the clerks of town and local boards of health and PRACTICING PHYSICIANS, in relation to the prevalence of any disease, or knowledge of any known or generally believed source of disease, or causes of general ill-health, and also in relation to the proceedings of the said boards of health, in respect to acts for the promotion and protection of the public health, and also in relation to diseases among domestic animals in their several towns and localities respectively, and the said clerks of town and local boards of health, and the said PRACTICING PHYSICIANS shall give such information, in reply to said inquiries, of such facts and circumstances as shall have come to their knowledge.

IN REPLY TO CIRCULAR NO. 29.

The following reports, received from local correspondents of the medical profession in the several cities, towns and villages of the State, will give a good representation of the general status of the public health during the year 1884, as to the presence or absence of epidemics or endemics in the several locations, the sanitary conditions and improvements, if any, in their several circuits, and other suggestions in response to the preceding circular:

BRISTOL COUNTY.

1. WARREN AND BARRINGTON.

2. Taking sickness of all kinds, there has been about the same as usual in this circuit during the past year.

3. The following diseases have prevailed during the year:

Cholera Infantum. Sporadic, mild.

Croup. Sporadic, mild.

Diarrhea and Dysentery. Average, summer months.

Diphtheria. None.

Fever, Malarial. Average or perhaps a trifle less than year ago. Fall months; Barrington, principally.

Fever, Typhoid. Average number of cases; mild.

Measles. Increased number of cases; mild, general.

Scarlatina. None.

Small Pox. None.

Whooping Cough. Increased number of cases compared with past years; mild, general.

4. No zymotic disease epidemic.

Brain, Inflammation and Congestion of. A few cases of inflammation and congestion of the brain, two of which were transmatic.

Bronchitis, Acute. Common. Winter months, 1884–5.

Meningitis, Cerebro Spinal. One case in another physician's practice; isolated case.

Pneumonia. Unusually common. Winter months, 1884-5.

Rheumatism. Rather large. Winter months, 1884–5.

Stomach, Acute diseases of. Average.

5. No diseases, not classed as zymotics, have had unusually large prevalence.

6. Of no diseases can we claim that they have been unusually fatal.

7. Increased attention has been particularly given to the improvement of the premises of the manufacturing companies tenements.

G. L. Church, M. D.

1. Bristol.

2. There has been less sickness of all kinds the past year.

There were a few cases of cholera infantum in July and August of average severity.

Croup. A few cases of spasmodic croup.

Diarrhea and Dysentery. A few sporadic cases.

Fever, Malarial. A few sporadic cases.

Fever, Typhoid. During the months of September and October typhoid fever prevailed, about forty cases in all, with only three or four deaths.

Scarlatina. There were a few cases of scarlet fever; which continued some two months very mild in severity. Only one death reported.

Whooping Cough. A few cases.

4. No other zymotic diseases to my knowledge.

Brain, Inflammation and Congestion of. A few cases.

Bronchitis, Acute. Average number of cases in January, February and March.

Pneumonia. Rather small prevalence: no deaths.

Rheumatism. A few cases of mild type.

Stomach, Acute diseases of. A few cases of gastric fever in September and October; no deaths.

5. No diseases, to my knowledge, have had unusually large prevalence during the year.

6. No diseases have been attended with unusual fatality.

7. A few cases of scarlet fever communicated from one to another, to my knowledge, through milk.

8. The town council has not taken any action or made any regulation with reference to the public health or sanitary condition of the town, or any part thereof, during the year 1884.

T. H. Shipman, M. D.

KENT COUNTY.

1. Coventry and adjoining towns.

2. Taking sickness of all kinds there has been one-quarter less than usual in my circuit during the past year.

3. The following zymotic diseases have prevailed during the past year.

Cholera Infantum. But very few cases of a mild type.

Croup. But little croup and mostly spasmodic.

Diarrhea and Dysentery. Some mild cases of dysentery and during the winter months considerable diarrhea or "winter cholera."

Diphtheria. But little diphtheria until the past few months. At present it is quite prevalent, and some severe cases.

Fever, Malarial. A few mild cases.

Fever, Typhoid. But few cases and not severe.

Scarlatina. Only a very few cases and mild.

No important disease epidemic.

Other diseases as follows:

Bronchitis. Average.

Pneumonia. No large number.

Rheumatism. Average.

4. No diseases that appear every year, in any locality in my circuit, that seem to be endemic.

5. No diseases have had unusual large prevalence during the past year.

6. None attended with unusual fatality.

7. As to any advance in public sentiment or of individuals, can say that among individuals I think there has been some advance. Many are bringing the immediate surroundings of their dwellings under better hygienic conditions.

John Winsor, M. D.

1. Coventry, and portions of West Greenwich and Warwick.

2. Taking sickness of all kinds, *rather more* than usual. Less in the rural districts, but more through the villages.

3. The following zymotic diseases have prevailed during the past year:

Cholera Infantum. June, average; July, mild; August, severe (in small tenants' rooms).

Croup. Sporadic in September, October, November and December.

Diarrhea and Dysentery. Constant through summer months, but not severe.

Diphtheria. Mild cases nearly every month.

Fever, Malarial. A few severe cases, but all were imported with one exception.

Fever, Typhoid. Fewer cases than usual, but more severe.

Measles. Average prevalence, but very mild.

Scarlatina. A few cases late in fall; quite mild.

Whooping Cough. Small number, average cases.

No important disease epidemic.

Mumps. Quite prevalent for several months in autumn.

Other diseases as follows:

Brain, Inflammation and Congestion of. A very few cases during December.

Bronchitis. Average from January 1st to May, and from October to January.

Erysipelas. But few cases and they severe; *some fatal.*

Pneumonia. Average severity and many cases.

Rheumatism. Numerous cases but ordinarily mild.

Stomach, Acute diseases of. Usual prevalence during summer months.

4. As to diseases that regularly appear in any locality that seem to be endemic may say that sore throats, diphtheritic form, when the reservoirs are low appear at Coventry Centre every year.

5. No diseases, not classed as zymotics, have had unusual large prevalence during the year.

6. No diseases unusually fatal.

7. A few families have made sanitary improvements.

F. D. Smith, M. D.

1. East Greenwich and Warwick.

2. Taking sickness of all kinds there has been in my circuit during the year rather less than the average, say 10 per cent.

3. The following diseases have prevailed during the year:

Cholera Infantum. A few cases in August and September. Sporadic; average in severity.

Diarrhea and Dysentery. Rather less than usual; generally mild.

Diphtheria. Occasional sporadic cases; mild.

Fever, Malarial. Less than the previous year.

Fever, Tyhoid. A few cases; not epidemic.

Scarlatina. Cases in clusters in families. Infection traceable to other cases and other places. Not very malignant.

Whooping Cough. In early summer.

4. No zymotic disease becoming epidemic.

Bronchitis, Acute. Some cases in early spring months.

Pneumonia. Usual amount in winter and spring, and again in autumn.

Rheumatism. Several cases of marked inflammatory rheumatism in the autumn.

5. No diseases have had unusual large prevalence.

6. None attended with unusual fatality.

7. In a family where four cases of scarlet fever occurred in December, there was communication with relatives in Westerly who had the disease.

8. Some slight progress in the line of sanitary improvements.

James H. Eldridge, M. D.

1. East Greenwich and vicinity.

2. There has been hardly the usual amount of sickness during 1884.

3. The following diseases have prevailed in my circuit during the year:

Cholera Infantum. A few cases in the summer months.

Croup. A few cases scattered throughout the year. No cases of membraneous croup.

Diarrhea and Dysentery. The usual number of cases during the summer months. Three cases of dysentery in December.

Diphtheria. A few cases.

Fever, Malarial. Quite a number of cases in this vicinity but not in the village of Greenwich. These cases occurred monthly during September, October, November and December.

Fever, Typhoid. The usual number of cases in this vicinity. Only one case in the village of Greenwich. This case occurred near the locality of a cesspool that overflows more or less continually into the gutter of the street. Three years ago three cases of diphtheria occurred on the same street where this gutter is, but further down the street.

Scarlatina. Quite a number of cases scattered throughout the year, but considerably more prevalent in October, November and December.

Whooping Cough. Has prevailed to some extent.

4. No zymotic disease epidemic.

Brain, Inflammation and Congestion of. Usual amount.

Bronchitis, Acute. Usual amount; spring and fall.

Pneumonia. Usual prevalence; January, February, March, November and December.

Rheumatism. Usual prevalence; throughout the year.

Stomach, Acute diseases of. Small prevalence; summer months.

5. No diseases had very large prevalence during the past year.

6. None unusually fatal.

7. The first case of scarlet fever in this village, occurring in the fall, was traced to the case of a child that had the disease in Providence, and came here very soon after recovery. One child in a certain family took the disease from the child from Providence. This child gave it to another and so on until thirteen cases were directly traced in this way. After the thirteenth case the next case was not traceable to any particular person.

8. Not much advancement in the direction of higher sanitary views.

E. G. Carpenter, M. D.

1. Warwick and Cranston.

2. Taking sickness of all kinds, there has been about the usual amount during the past year in my circuit, except croup.

3. The following diseases have prevailed in my circuit during the year:

Cholera Infantum. Several cases in Pontiac and Hill's Grove during the months of June, July and August.

Croup. Thirty cases and four cases of membranous, which were fatal, occurred in Pontiac, Oak Lawn and at Pumping Station, Cranston.

Diarrhea and Dysentery. Average.

Diphtheria. Has prevailed to some extent but sporadically.

Fever, Malarial. Has prevailed nearly every month in Pontiac.

Fever, Typhoid. There were several cases of severe typhoid in Apponaug, and during the nine years I have practiced in Warwick I have had several severe cases of typhoid fever in Apponaug, owing, I think, to a filthy cove.

Whooping Cough. Several sporadic cases.

4. No zymotic disease epidemic.

Brain, Inflammation and Congestion of. Small number.

Bronchitis, Acute. Average.

Meningitis, Cerebro Spinal. Small number; sporadic.

Pneumonia. Large prevalence; November and December.

Rheumatism. Large prevalence; October, November and December.

Stomach, Acute diseases of. Small number.

5. No diseases have had unusually large prevalence during the past year, except croup and rheumatism.

6. No diseases have been attended with unusual fatality except croup.

Dan. O. King, M. D.

1. Warwick, Centreville, Crompton, Quidnick, Phenix, Natick and vicinity.

2. Taking sickness of all kinds, there has been about an average during the past year.

3. The following diseases have prevailed in my circuit during the year:

Cholera Infantum. Sporadic in summer months; rather mild.

Croup. Sporadic; average in fall months.

Diarrhea and Dysentery. Less than year before and mild; mostly in summer.

Diphtheria. Have met less cases and in general less severe. A few fatal cases in Crompton and Anthony, where it seems to be more severe in last months of the autumn and beginning of winter.

Fever, Malarial. Very few cases and mild.

Fever, Typhoid. Rare and mild.

Measles. Sporadic all around this vicinity, epidemic in Natick; severe in September, October and November.

Scarlatina. About average prevalence; not severe.

Whooping Cough. Average in winter.

4. No other zymotic disease becoming epidemic.

Brain, Inflammation and Congestion of. Average; the year round.

Bronchitis, Acute. Large; November and December.

Meningitis, Cerebro Spinal. Small; all year.

Pneumonia. Small prevalence.

Rheumatism. Small number; all year.

Stomach, Acute diseases of. Average prevalence; summer.

5. No diseases have had very large prevalence during the year.

6. No diseases of unusual fatality.

7. Under my observation I can say that scarlet fever, diphtheria and typhoid fever are easily and frequently communicated from one person to another.

8. No public efforts have been made in regard to the importance of sanitary surroundings, or any increased interest in means of preventing diseases; some private.

M. J. E. Legris, M. D.

NEWPORT COUNTY.

Newport, Middletown and Jamestown.

In reply to the circular No. 29, calling for a report from various sections of the State, I have the honor to report from Newport, as follows:

During the year closing with December 31, 1884, the amount of sickness has not been above the average. Diseases have generally assumed a mild form, and the mortality in the epidemics prevailing has been exceptionally low.

Cholera infantum, diarrhœa and dysentery have not prevailed to any extent; in fact during the summer months the number of cases of intestinal diseases were exceptionally low, with very little mortality.

Diphtheria. There have probably been fewer cases of this disease during the past year than for many previous years.

The impression prevails among the majority of people that this disease can be contracted from another only by coming in contact with the party affected. I

myself have been of this opinion until within the past few years. I now feel positive that the disease may be conveyed to another without the person conveying the poison being apparently affected by the disease.

A case confirming this opinion has recently come under my notice, where a person visited frequently a child dying from diphtheria, coming in close contact with the child by frequently examining the throat and handling the patient. Three days subsequent to its death, a member of the household of this visitor was taken with a sharp attack of diphtheria. The visitor, however, was free from all throat trouble and apparently in a perfect state of health. His home was in a perfect sanitary state, having been pronounced so by experts. The members of the household, sick with the disease had not been out of the house for many days, so that there was no possible source of contagion except through the visitor who saw the child; the visitor, however, being apparently unaffected by the disease.

Malarial fever, originating in Newport, is met with only occasionally, and then only among the patients residing in a section on the border of the city, which is low and badly drained. In the city proper malaria never originates.

During the early months of the year there were more cases of typhoid fever than usual, most of the cases were of a mild form. The mortality very slight. In every case of typhoid fever that came under my observation, radical sanitary defects were found to exist on the premises.

There have been no cases of small pox.

Measles, chicken pox and mumps, of a mild type have existed in the city during the past year.

Whooping cough and scarlet fever of a mild form have prevailed very extensively.

There has been nothing special to note about either of these diseases in this epidemic, excepting that owing to the unusually mild type of the scarlet fever, many of the patients have been out doors and even to school, not being aware that they have had the disease till the desquamation had taken place. In consequence of the mildness of the constitutional disturbance, and the disease not being early recognized, and the non-enforcement of a strict quarantine, the epidemic has been unusually extensive. The mortality has been very slight.

Owing to the sudden and great atmospheric changes during the early months of the year, influenzal colds, pharyngitis and laryngitis were very common, frequently every member of a family would be affected, showing almost a contagious character.

During the summer months the city was in an unusually healthy state. As stated above, there were fewer cases of intestinal troubles than usual. There was also a marked decrease in the number of cases of low fever which are commonly met with as the Fall approaches. This can be attributed to two facts. 1st. A better sanitary state of the city, the streets and eye-holes of the sewers having been kept in a much better condition. 2d. The supply of water was more abundant. The frequent rains kept the wells and cisterns full.

Bronchitis, erysipelas, pneumonia and rheumatism have not been more prevalent than in previous years.

We have had no cerebro spinal meningitis.

In reply to the question, has there been any advance in public sentiment regarding sanitary surroundings, &c., I am pleased to give a very positive answer in the affirmative. For six years a few of the citizens of Newport have been working with an earnest determination to improve the sanitary condition of the city, and have striven with an unyielding purpose to have an independent Board of Health.

The Sanitary Protection Association, as has been fully reported in one of the previous reports of the State Board of Health, was formed for improving the sanitary condition of the premises of its members, and for the encouragement of a better state of sanitation in the city at large. This society is in a flourishing condition and its influence is felt upon the community.

A few of the citizens of Newport, most of them members of the Sanitary Protection Association, have during the past six years, held to the one purpose of having an independent board of health for our city. They have met with great discouragement and opposition, but are at last rewarded by seeing this independent board of health established. I think Newport should feel proud of this board, for it is the only independent board of health established in our State, and, if I mistake not, it has more power for abating nuisances than the State Board of Health. The creation of this board has only been reached after a struggle. The first concerted action was by the doctors, fifteen of whom sent a petition to the city council in 1878 asking for an independent board of health. Frequent letters to the local papers, and editorials in the papers, kept this subject before the people and brought it to the attention of the city government.

In 1879 an advisory board of health was established but was in existence only for one year.

In 1881 a lengthy petition, signed by a very large number of the business men and citizens, was sent to the city government praying for the establishment of a board of health. Petitions were subsequently sent to the same authorities by the board of school trustees, by the Sanitary Protection Association, and by the Newport Medical Society. During the past few months the subject has been revived with increased vigor, stimulated by the probable advent of cholera to the United States during the coming summer.

The physicians were again active in the matter, and issued an open letter, signed by almost every doctor in the city, and all the surgeons of the army and navy stationed at Fort Adams, the Torpedo Station and the Training Ships. A petition signed by about one hundred and fifty of the leading citizens was also sent to the city government asking for a board of health. The action taken by the State Board of Health in issuing the very comprehensive paper on "Suggestions in relation to Asiatic Cholera," has very materially aided the cause. For this article, and it was pointedly brought to the attention of the city council, shows very clearly the importance of good sanitation, as well as the importance of there being in every community a body of men who are competent and *have the power* to deal with sanitary questions and especially with epidemics when they arise.

Our present city government and the community at large, are very much in earnest in the desire to have the city in a thoroughly good sanitary state; in a condition, that cholera, if it should appear in our midst will find the city in a state that the dread epidemic may speedily be checked. A large number of new

and expensive sewers have been built, and increased attention has been paid to the cleaning of our streets and the removal of house refuse.

This report is written in February, 1885, and I take the liberty to mention the fact, which does not strictly belong to the report of 1884, that the city government on February 6, 1885, created an independent board of health for our city. The board has been appointed for one year, and has all the powers which were previously vested in the board of aldermen as board of health. The board is composed of good men, and we feel confident that the work they will do will create a desire on the part of the city government to continue this separate board of health beyond the present year.

I enclose with this the ordinance adopted by the city government creating a board of health.

FRANCIS H. RANKIN, M. D.

CITY OF NEWPORT.

AN ORDINANCE TO APPOINT A BOARD OF HEALTH AND CONFER CERTAIN POWERS AND DUTIES THEREON.

It is ordained by the City Council of the City of Newport as follows:

SECTION 1. Such three practising physicians and two other citizens as the City Council of the city of Newport shall elect, are hereby appointed a board of health of said city from and after the passage hereof until the first Monday in January, A. D. 1886.

SECT. 2. The members of said board shall qualify in the same manner as all other city officers.

SECT. 3. The said board shall elect from its own members a president and a secretary.

SECT. 4. The duties of said secretary shall be to keep a record of the proceedings at all the meetings of said board, to keep all the records of the board, and to prepare and compile all such reports and statistics as the board may from time to time direct or have in charge.

SECT. 5. The said board shall, over the signature of its president and secretary, recommend to the City Council as soon as may be, and from time to time as may be necessary, the name of some suitable person, who, upon the appointment of the City Council, shall be the executive officer of said board during the pleasure and subject at all times to the orders thereof and shall receive compensation at the rate of eight hundred dollars a year.

SECT. 6. The said board shall, as soon as may be, draw up a series of regulations pertaining to the public health of the city of Newport, and present the same to the board of aldermen thereof at its next or any subsequent meeting for consideration, and upon the approval and enactment of said regulations either in whole, or in part, or with amendments by the board of aldermen, the said regulations or such of them as have been enacted, shall go into effect in the same manner as all other regulations of the board of aldermen acting as a board of health; and the board hereby appointed may from time to time propose such further regulations as they may deem proper, which upon being presented to

and enacted by the board of aldermen as aforesaid shall also go into effect as aforesaid.

Sect. 7. The board hereby appointed shall make all proper inquiries into the condition of the public health of the city of Newport and into all things in said city which may in any way affect the health thereof; it shall prepare and compile all such statistics relating to the health of said city as it may deem proper; it shall see to the enforcement of all laws pertaining to the health of said city, as well as the regulations originating with said board as those of the board of aldermen acting as a board of health; it shall receive and consider all complaints of alleged nuisances in said city or of breaches of any of the aforesaid laws, and all complaints received by the board or by any member thereof shall be at once communicated to its executive officer, who, upon receipt thereof, or upon any other information of such nuisances or breaches of said laws, shall inquire into the truth or falsity of such complaint or information and shall, as the case may require report the result of his inquiries to the board at its next meeting (and for this purpose he may call a special meeting of the board) or take such legal steps in the premises as may be necessary and proper.

Sect. 8. The said executive officer and the inspector of nuisances of the city of Newport shall be at all times subject to the direction of said board.

Sect. 9. The executive officer, the inspector of nuisances and all the members of the board hereby appointed, shall, in pursuance of any complaint or information of nuisances or breaches of the law as aforesaid, have power to enter the house and premises of any person, to make inspection thereof and to do all things which may in law be necessary and proper, at all times between the hours of nine o'clock A. M. and five o'clock P. M.

Sect. 10. The said board shall meet from time to time in their discretion, or at the call of the president thereof, or at the call of the executive officer as aforesaid, or at the call of the secretary upon the written request of any two members; and three members of the board shall constitute a quorum for the transaction of all business. The place of meeting of the board shall be the common council chamber of the city of Newport.

Sect. 11. All vacancies in the membership of the board, by resignation or otherwise, shall be filled by appointment by the City Council.

Sect. 12. The executive officer and inspector of nuisances shall keep minute books in which they shall make notes of all reports, orders and inspections made to and by them with the results thereof, and their proceedings thereon, which books shall, at the expiration of their terms of office and at least once in every three months, be turned over to the secretary who shall keep the same among the records of the board.

Sect. 13. The board shall from time to time in its discretion, and at least once in each month, report to the board of aldermen the condition of the public health of the city of Newport with such facts and recommendations in regard thereto or in regard to the operation of the board hereby appointed, as it may deem proper.

Sect. 14. The members of the board hereby appointed shall serve without compensation; provided however that they shall be paid such actual necessary

expenses incurred in the performance of their duties as the City Council of the city of Newport may from time to time allow.

SECT. 15. This ordinance shall take effect immediately.

[Passed February 6, 1885.]

1. LITTLE COMPTON and TIVERTON.

2. Taking sickness of all kinds, there has been more than usnal in my circuit during the past year; say 100 per cent. more.

3. The following diseases have prevailed in my circuit during the year:

Cholera Infantum. No severe cases.

Diarrhea and Dysentery. A few cases but none severe.

Diphtheria. Two cases; one very severe, the other mild.

Fever, Malarial. No cases of malarial disease proper.

Fever, Typhoid. Several cases; two died. I think the cause was really that all the slop water was thrown out the back door, the well being only a few steps from the door.

Measles. Have been very prevalent. I have had one hundred cases. They have been very severe in the majority of cases. Diphtheritic sore throat, parotitis and typhoid fever accompanying them. Generally scattered throughout the town, and very epidemic; still epidemic at time of writing.

Whooping Cough. A number of cases in the early and middle portion of the year.

No other important disease becoming epidemic.

Bronchitis. Small number.

Pneumonia. Small prevalence.

Rheumatism. Average.

5. No disease has had unusual large prevalence during the past year, except measles.

6. No disease has been attended with unusual fatality, except measles.

I. B. COWEN, M. D.

1. NEW SHOREHAM.

2. Taking sickness of all kinds, there has been about an average amount in my circuit during the past year.

3. The following diseases have prevailed during the past year:

Cholera Infantum. Three sporadic cases; average severity.

Diarrhea and Dysentery. A few cases of diarrhea during the summer months.

Diphtheria. No cases of diphtheria have occurred.

Fever, Malarial. Malarial diseases have no home here.

Fever, Typhoid. Two sporadic cases.

Scarlatina. One case severe; miliary eruption.

No disease epidemic.

Bronchitis. But few cases.

Pneumonia. One case; December.

Rheumatism. Small prevalence.

Stomach, Acute diseases of. Small number.

5. No diseases have had unusually large prevalence during the year.

6. None have been attended with unusual fatality.

8. A gradual advance in public and also of individual sentiment in regard to sanitary condition of dwellings and surroundings.

C. H. Hadley, M. D.

PROVIDENCE COUNTY.

2. Lonsdale and vicinity, towns of Cumberland and Lincoln.

3. Taking sickness of all kinds there has been in this circuit during the past year rather more than usual because of increase of intermittent fever.

4. The following diseases have prevailed in this circuit during the year:

Cholera Infantum. Number of cases less than the average; fatality, as usual, great; chiefly in factory villages.

Croup. An unusual number of cases in December; fatal.

Diarrhea and Dysentery. Number below rather than above the average; of ordinary severity.

Diphtheria. In November and December more cases have occurred within a radius of three miles from Lonsdale than during the twenty preceding years. Fatality large.

Fever, Malarial. Since the appearance of the disease three summers ago the number of cases have about doubled each season, but this cannot continue more than another year for *then* all will have it.

Fever, Typhoid. For the past ten years very few cases. The epidemic began in April but was worst in September, steadily decreasing in October, and almost ceasing during November and December.

Measles. Very little.

Scarlatina. Sporadic cases all the year through, of a mild type, often followed by rheumatism, scarcely ever by acute desquamative nephritis, as was formerly the sequel of a large proportion.

Whooping Cough. Epidemic began in December.

5. No other zymotic disease becoming epidemic.

Bronchitis, Acute. Rife in cold months.

Meningitis, Cerebro Spinal. A few cases.

Pneumonia. Few cases in the autumn; most in March.

Rheumatism. No more than average.

7. Diphtheria has been attended with unusual fatality.

8. A child had scarlet fever in Lonsdale early in August, an average case. About a month afterwards she went home to Olneyville; soon afterwards the younger members of her family all had the disease.

9. More perceptible advance in public sentiment in regard to sanitary surroundings.

L. F. C. Garvin, M. D.

2. Foster and part of Scituate.

3. Taking sickness of all kinds there has been about the same as usual in my circuit during the past year.

4. The following diseases have prevailed in my circuit during the year:

Cholera Infantum. Few cases; mild.

Croup. Occasional; mild.

Diarrhea and Dysentery. About as usual.

Diphtheria. Few cases.

Fever, Malarial. Mild cases; imported.

Fever, Typhoid. Mild; average number.

Measles. Large number, mild. December, No. 14 School District; sporadic elsewhere.

Whooping Cough. Mild; few cases.

5. No epidemics prevailed in this vicinity during the year.

Brain, Inflammation and Congestion of. Very few cases.

Bronchitis, Acute. Scattered cases.

Meningitis, Cerebro Spinal. Few cases.

Pneumonia. About the average. Winter and spring.

Rheumatism. About the average.

Stomach, Acute diseases of. Few cases.

6. No diseases have had unusually large prevalence during the year except measles.

7. No diseases have been attended with unusual fatality.

M. P. Arnold, M. D.

2. Johnston, parts of Providence City, North Providence and Cranston.

3. Taking sickness of all kinds there has been a full average during the past year.

4. The following zymotic diseases have prevailed during the year:

Cholera Infantum. About the same as in 1883, more than in the average of years.

Croup. Occasional through the year; not large.

Diarrhea and Dysentery. Unusual prevalence in warm months.

Diphtheria. There was a very large prevalence of diphtheria during the spring and fall months, subsiding during the hot weather. Of average severity.

Fever, Malarial. Prevalence larger than during any previous year from May to November. Occasional cases of great severity.

Fever, Typhoid. Not above an average of previous years.

Measles. Almost epidemic in the fall months. Smaller prevalence through the year. Rothelm also quite prevalent.

Scarlatina. Large prevalence spring and fall. Average severity. Cases rather milder in some localities than others in adjoining towns and in same town.

Whooping Cough. Small prevalence first part of the year.

5. No other zymotic disease largely prevailing.

Brain, Inflammation and Congestion of. Very few cases. Mostly in warm months.

Bronchitis, Acute. Large number scattered through the year, but mostly in the colder months of the spring and fall.

Meningitis, Cerebro Spinal. Occasional, sporadic; very few.

Pneumonia. Unusually large prevalence through the year. Mostly in the colder months.

Rheumatism. Large prevalence in the fall, also rather frequent through the year.

Stomach, Acute diseases of. A few cases only.

6. No diseases have had unusually large prevalence during the past year except as indicated above.

7. Pneumonia has been attended with unusual fatality.

9. There has been manifested a considerable advance in public sentiment and in views of individuals in this vicinity in regard to the importance of sanitary surroundings. The town sanitary ordinances are much better enforced, many nuisances abated, public and private; increased attention paid to out door premises of dwellings, the health officers are more active, and probable sources of disease have more careful attention.

G. R. Fisher, M. D.

2. Glocester, with parts of Burrillville and Smithfield.

3. Taking sickness of all kinds there has been 10 per cent. more than usual in this circuit during the past year.

4. The following diseases have prevailed during the year:

Cholera Infantum. A few sporadic cases.

Croup. One case true croup; fatal. April.

Diarrhea and Dysentery. No epidemic. The usual amount of sporadic cases.

Diphtheria. Five cases in one house; three fatal; October.

Fever, Typhoid. In Burrillville, September, October and November. Epidemic from bad water and no drainage; severe.

Scarlatina. A few cases in Glocester; severe. Many in Burrillville of average severity.

5. No other disease becoming epidemic.

Brain, Inflammation and Congestion of. Very small prevalence.

Bronchitis, Acute. Small number, January to May.

Pneumonia. Large prevalence, May, June, October, November and December.

Rheumatism. Average.

Stomach, Acute diseases of. Average.

6. No diseases, not classed as zymotics, have had unusually large prevalence during the past year.

7. No diseases have been attended with unusual fatality.

8. In several cases of diphtheria and scarlatina the disease was undoubtedly contracted from other patients.

9. No apparent advance in public sentiment or views of individuals in this circuit, in regard to the importance of sanitary surroundings.

DRS. POTTER and HARRIS.

1. Vicinity of CENTRAL FALLS, SAYLESVILLE and LIME ROCK, towns of PAWTUCKET and LINCOLN.

2. Taking sickness of all kinds there has been about the same as usual in this vicinity during the past year.

3. The following diseases have prevailed during the year:

Cholera Infantum. Sporadic; summer months.

Croup. But few cases.

Diarrhea and Dysentery. Average; July and August.

Diphtheria. A few cases; November and December.

Fever, Malarial. Many cases—140 besides office patients; January, 2; February, none; March, 4; April, 13; May, 25; June, 15; July, 13; August, 8; September, 22; October, 18; November, 6; December, 4. One well marked case of remittent fever.

Measles. A few cases in December.

Whooping Cough. Small amount.

Bronchitis. Average prevalence through the year.

Erysipelas. A few cases only.

Pneumonia. Few mild cases in November and December.

Rheumatism. Small number.

5. No diseases not classed as zymotic, have had unusually large prevalence during the past year.

6. No diseases have been attended with unusual fatality.

8. As to any advance in regard to the importance of sanitary surroundings, or increased interest in questions appertaining to means of preventing diseases, I have seen no evidence in public sentiment or of individuals in this direction during the year.

A. H. NICKERSON, M. D.

2. Pawtucket and Lincoln.

3. Taking sickness of all kinds there has been less in the first half of the year and more in the last half than usual in this circuit.

4. The following diseases have prevailed during the year:

Cholera Infantum. Mild in early summer.

Croup. Severe; December, all over town.

Diarrhea and Dysentery. Average; mild in summer.

Diphtheria. Considerable; severe in December.

Fever, Malarial. Considerable; mild. All summer, and especially in September and October.

Fever, Typhoid. Considerable; mild. August, September, October and November.

Measles. Very prevalent; mild. Fall and winter.

Scarlatina. Much; mild. Fall and winter.

Whooping Cough. Considerable.

5. No disease becoming fairly epidemic.

Brain, Inflammation and Congestion of. Slight prevalence.

Bronchitis, Acute. Considerable; January, February, December.

Pneumonia. Moderate prevalence; January, February, December.

Rheumatism. Small amount.

7. The diseases that have been attended with unusual fatality are diphtheria and croup.

9. I see very little advance in public sentiment or views of individuals in this circuit, in regard to the importance of sanitary surroundings.

F. B. Fuller, M. D.

2. North Scituate and parts of Smithfield and Johnston.

3. Taking sickness or all kinds, there has been less than usual in my circuit during the past year. Considerable less the first nine months; more during the last three months.

4. The following zymotic diseases have prevailed in my circuit during the year:

Cholera Infantum. Not a large number. Less than average.

Croup. Only a few cases.

Diarrhea and Dysentery. Very little dysentery. Diarrhea quite largely prevalent in July and August; quite mild.

Diphtheria. Very few cases.

Fever, Malarial. Quite prevalent all about, rather more than last year; average severity.

Fever, Typhoid. Very few cases. Fall months; mild.

Scarlatina. Slight prevalence first part of the year. Almost epidemic in the fall months; mild type.

Whooping Cough. Large prevalence last half of the year; severe form.

Other diseases have prevailed as follows:

Bronchitis, Acute. Large numbers last two months of the year. Average in first months; average severity.

Pneumonia. Average number first half of year. Very large prevalence, November and December; severe type.

Rheumatism. Less than average.

Stomach, Acute diseases of. Few cases only.

6. No other diseases have had unusually large prevalence during the year.

7. Pneumonia was unusually fatal.

9. Have seen very little advance in public sentiment in regard to the importance of sanitary surroundings, or increased interest in means of preventing diseases.

W. J. Smith, M. D.

2. Smithfield, and parts of Johnston, Scituate and Glocester.

3. Taking sickness of all kinds, there has been one-third less than usual during the past year.

4. The following diseases have prevailed in this circuit during the year:

Cholera Infantum.. Moderate prevalence; mild.

Croup. A few cases only: mild.

Diarrhea and Dysentery. Less than usual; mild.

Diphtheria. Small number; average severity.

Fever, Malarial. Not many cases; mild. Late warm months.

Fever, Typhoid. Slight prevalence; mild form.

Whooping Cough. Epidemic; mild.

5. No other zymotic disease becoming epidemic.

Brain, Inflammation and Congestion of. Small number.

Bronchitis, Acute. Average prevalence and severity; spring months.

Pneumonia. Average number, not severe; cold months.

Rheumatism. Small number; no particular date.

Stomach, Acute diseases of. Small prevalence; summer.

7. No diseases have been attended with unusual fatality. Death rate has been light.

9. Sanitary measures are being rather better observed through the influence of more general enlightenment on that question.

R. P. Eddy, M. D.

2. Woonsocket and surrounding towns.

3. Taking sickness of all kinds, there has been about an average amount in this circuit during the past year.

4. The following diseases have prevailed during the year:

Cholera Infantum. Sporadic; average; July and August; centre of town of Woonsocket.

Croup. Sporadic; January and February; outskirts.

Diarrhea and Dysentery. Sporadic; mild; July and August.

Diphtheria. Sporadic; almost none.

Fever, Malarial. Almost epidemic; mild; every month of the year.

Fever, Typhoid. Sporadic; November and December; severe cases much scattered; in country and town, on high land as well as low.

Scarlatina. Sporadic; January and February, severe; centre of town.

5. No other zymotic disease epidemic.

Brain, Inflammation and Congestion of. Small number.

Bronchitis, Acute. Average of previous years.

Meningitis, Cerebro Spinal. Small number.

Pneumonia. Average prevalence.

Rheumatism. Large; January, February, November, December.

Stomach, Acute diseases of. Average.

6. No disease, not classed a zymotic, has had unusually large prevalence during the past year, except rheumatism.

7. No diseases have been attended with unusual fatality.

8. All my cases of scarlet fever were directly traceable to personal contact. Have no facts in relation to diphtheria or typhoid fever.

9. Very little if any advance in public sanitary sentiment.

WM. C. MONROE, M. D.

1. CITY OF PROVIDENCE.

2. Taking sickness of all kinds, there has been evidently rather more than usual during the past year. The severity of the cases of the different kinds of sickness has, however, been less than the average of the same kinds as they usually occur.

3. The following zymotic diseases have prevailed in this city during the year:

Cholera Infantum. The prevalence was much larger than during the previous year though not reaching epidemic proportions; the degree of severity about an average, mostly in July and August, but running into September quite largely.

Croup. Had an average prevalence through the year compared with previous years. The largest number of cases, however, occurred in the first quarter.

Diarrhea and Dysentery. Diarrhea was about as common as in previous years. Dysentery was much less prevalent. There was very little of either during the first six months.

Diphtheria. Prevailed through the year. Very little during the warm months; much the larger prevalence during November and December. Of average severity, and about average amount.

Fever, Malarial. Was much less prevalent around Mashapaug, its original starting place, and much more prevalent in the extreme southern part of the

city east of Roger Williams Park, and in the central, western and along the Woonasquatucket Valley. About an average amount taking the whole city, and of not above average severity.

Fever, Typhoid. The amount of typhoid fever was much less than during the two previous years. The average severity greater. Most prevalent in the fall.

Measles. About the average number, mostly in the first and last months of the year. Average severity.

Scarlatina. Prevailed to a greater extent than during any year since 1880. Was most prevalent during the last three months of the year. In November it seemed to approach epidemic proportions; average severity.

Whooping Cough. An increased number over the previous year, but not epidemic; average severity.

Brain, Inflammation and Congestion of. Average prevalence, scattered through the year.

Bronchitis. An increased number over previous years. Distributed through all the months; not of great severity.

Erysipelas. Not above the usual number and not generally severe.

Meningitis, Cerebro Spinal. Less than the average prevalence.

Pneumonia. At least an average number, but hardly of average severity. Mostly in the first five months of the year.

Rheumatism. Has had large prevalence all through the year in chronic form. Acute rheumatism about an average number and average severity.

Stomach, Acute diseases of. Rather large prevalence; not above usual severity.

4. There are no diseases that regularly appear every year in any locality that seem to be endemic, except those of a malarial character.

5. The diseases not classed as zymotics, that have had unusually large prevalence during the past year are bronchitis and rheumatism.

6. No diseases have been attended with unusual fatality.

8. There is evidently a very considerable advance in public sentiment and of individuals in this city, in regard to the importance of sanitary surroundings. Sanitary questions are more frequently a topic of conversation, more frequently discussed in the municipal council and board of aldermen, in the schools, in the various associations, and in the newspaper press.

C. H. Fisher, M. D.

WASHINGTON COUNTY.

2. Hopkinton, parts of Charlestown, Richmond and Westerly.

3. The average amount of sickness of all kinds in this circuit in 1884, has been about the same as for the past few years.

4. The following zymotic diseases have prevailed during the year:

Cholera Infantum. A few sporadic cases.

Croup. There has been less cases of croup reported than an average.

Diarrhea and Dysentery. Prevailed during the summer months but not as an epidemic. There was an unusual amount of dysentery among children (under three years of age), during the latter part of June and July.

Diphtheria. There have been a few mild cases of diphtheria extending through the year.

Fever, Malarial. A few cases, but mostly imported; in the spring and early summer.

Fever, Typhoid. Prevailed during the late summer and fall, but there were less cases reported than usual; they were of the usual severity, although no cases were fatal, I think.

Scarlatina. A few sporadic cases of a mild form, in the spring and fall.

Whooping Cough. Prevailed as an epidemic in Plainville (Richmond) during the summer and fall of unusual severity. One or two cases terminated fatally.

Bronchitis, Acute. About an average.

Pneumonia. Less than an average; cold months.

Rheumatism. Less than an average; scattered through the year.

Stomach, Acute diseases of. About an average of previous years.

6. No diseases not classed as zymotics, had unusually large prevalence.

7. No diseases have been attended with unusual fatality.

9. There has been no marked advancement in sanitary improvement during the past year.

A. B. Briggs, M. D.

2. Westerly.

3. Taking sickness of all kinds, and allowing for an increase of practice, I should judge 20 per cent. more sickness has prevailed during 1884, than in the previous year.

4. The following diseases have prevailed during the year:

Croup. Sporadic cases throughout the year.

Diarrhea and Dysentery. July to October; generally mild. Two deaths from dysentery in my practice.

Diphtheria. Have seen no genuine diphtheria during the year, but an abundance of follicular and ulcerative pharyngitis.

Fever, Malarial. May to September; less than in 1883 by 40 per cent. in my practice.

Fever, Typhoid. Nine genuine cases; one death.

Scarlatina. Epidemic began in December, 1884. Now very prevalent.

Whooping Cough. Spring of 1884 almost epidemic.

5. Influenza, epidemic April to June

Brain, Inflammation and Congestion of. Small, throughout year.

Bronchitis, Acute. Average throughout the year.

Meningitis, Cerebro Spinal. Small number.

Pneumonia. Large, February, May; unusually fatal.

Rheumatism. Average through the year.

Stomach, Acute diseases of. Not large.

6. No disease, not classed as zymotics, have had unusually large prevalence during the year, except pneumonia.

7. No diseases have been attended with unusual fatality, except pneumonia.

8. Numerous cases of personal infection from scarlet fever.

9. Unfortunately there has been little or no advance in public sentiment or views of individuals in this vicinity in regard to the importance of sanitary surroundings.

F. T. Rogers, M. D.

REPORTS FROM TOWNS

IN RELATION TO SANITARY IMPROVEMENTS, &C.

Reports from town authorities have been solicited as in previous years, in continuance of the purpose of the Secretary to keep well informed of all proceedings throughout the State, on the part of town or city councils, or any form of municipal authority, in the direction of improvements which have in view and seem to promise the promotion of the public health; by the abatement of nuisances; the removal of unsanitary conditions and surroundings; or by the introduction or establishment of public works, which may not only be of great public utility and convenience, but also serve in some measure, large or small, in the prevention of disease.

It is hoped that a connected history may thereby be secured of all sanitary improvements of a public character in all parts of the State, from year to year, and the gradual awakening of the citizens of the different towns to the necessity of sanitary public measures shown, and also whatever intelligent appreciation of such necessity, and whatever public spirit in existence in the towns there may be, as manifested by the readiness with which needed sanitary measures are adopted.

For this purpose a circular has been sent, at the close of every year, to each town clerk in the State, wherein various questions are submitted in relation to the proceedings of the respective town authorities, in the direction of general sanitation, during the preceding year.

The following is the form of circular sent at close of the year 1884:

CIRCULAR S.

OFFICE OF SECRETARY OF THE STATE BOARD OF HEALTH,

PROVIDENCE, R. I., Jan. 1, 1885.

To the Town Clerk:

It is, by statute law, made the duty of the Secretary of the State Board of Health, to make inquiries of the clerks of local boards of health, (town councils)

in regard to the general health and sanitary condition of the towns, and also in regard to measures taken for the improvement of the same.

The law reads as follows:

PUBLIC STATUTES, CHAPTER 83.

SEC. 6. The Secretary of the said Board shall make inquiry from time to time, of the clerks of town and local boards of health and practicing physicians, in relation to the prevalence of any disease, or knowledge of any known or generally believed source of disease, or causes of general ill-health, and also in relation to the proceedings of the said boards of health, in respect to acts for the promotion and protection of the public health, and also in relation to diseases among domestic animals, in their several towns and localities, respectively; and the said clerks of town and local boards of health, and said practicing physicians, shall give such information, in reply to said inquiries, of such facts and circumstances as have come to their knowledge.

The Secretary therefore makes the following inquiries:

1. Has there been, within your knowledge, any very fatal or very serious disease, that has prevailed largely in your town during the last year?

2. Have there been any cases of small pox in your town during the last year? If any, how many cases and how many deaths have come to your knowledge? Do you know the source from whence derived?

3. Has any widely spread or largely fatal disease occurred among domestic animals in your town during the year? If any, please give name of disease or diseases, locality and time of year when prevalent.

4. Has any work for the promotion of public health been contemplated, commenced or completed in your town, by the proper authorities of the town during the year? If any, please state what.

5. If by introduction of water for general use, please state from what source, how large the supply, and what proportion of the population by estimation, were supplied with the same at the end of the year.

6. If by sewerage, state what the aggregate length of sewers, whether of iron or brick, where emptying, and what proportion of population had drainage connection with them at the end of the year.

7. If by abatement of nuisances, or by improvement in heating or ventilating public buildings, halls, school houses, &c., or by drainage of water-soaked ground around and beneath houses, or by compelling the removal of excreta, garbage, house refuse, &c., or for any other purpose. Please give terms and date of enactment of town ordinance, or send copy of same, and also state how far the ordinances have been enforced.

8. Has your town any legal board of health beside the town council? If so, please give the names of the officers of the same.

9. Do you have health officers in your town, responsible to town council, instead of an organized board of health? If so, please give names of said officers.

10. Has gratuitous vaccination been provided in your town during the past year?

Respectfully,

CHAS. H. FISHER,

Sec. State Board of Health.

N. B. The town clerk should charge a remunerative fee for replying to the above circular, and present to the town council, it being a service required by law.

REPORTS FROM TOWN CLERKS

In relation to the prevalence of disease, and of legal proceedings in regard to public sanitary improvements, and the promotion of public health, &c.

BRISTOL COUNTY.

BARRINGTON.

1. No very fatal or very serious disease has prevailed during the last year.

2. No cases of small pox.

3. No largely fatal disease occurred among domestic animals.

4. No particular work for the promotion of public health by the authorities of the town during the year.

8. This town has no legal board of health beside the town council.

10. Gratuitous vaccination has not been provided in this town during the past year.

MARK H. WOOD.

BRISTOL.

1. There has been no very serious or fatal disease largely prevailing in this town during the year 1884.

2. No cases of small pox.

3. No disease of consequence among domestic animals.

4. No particular work for the promotion of public health contemplated by the authorities of the town during the year.

5. Water was introduced in 1883, from the Kickamuit river; supply is abundant. The introduction of the same into residences is on the increase.

6. No sewers of any account, except for surface sewerage.

7. See Ordinance printed in Annual Report of Board of Health, 1883, (for the suppression and prevention of nuisances) also By-Laws relating to nuisances in the town of Bristol, same report.

8. No legal board of health beside the town council.

9. No health officers.

10. Gratuitous vaccination has not been provided in this town during the past year.

H. F. BENNETT.

WARREN.

1. Do not know of any very fatal or very serious disease that has prevailed largely during the last year.

3. No widely spread or largely fatal disease occurred among domestic animals.

4. No unusual work for the promotion of public health has been completed in the town by the authorities of the town during the year.

5. The Kickamuit water, a very large supply; enough for the city of Providence the most of year; very pure.

6. One drain in State and Washington streets; by individual from main street to the shore, cleansed and cleared with Kickamuit water.

8. No legal board of health beside town council.

9. No health officers in this town.

10. Gratuitous vaccination has been provided in this town during the past year.

HENRY H. LUTHER, *Town Clerk.*

KENT COUNTY.

COVENTRY.

1. No very fatal or very serious disease has prevailed.

3. No largely fatal disease occurred among domestic animals.

4. No particular work for the promotion of public health has been contemplated by the town authorities during the year.

7. No abatement of nuisances or improvement in heating or ventilating public buildings, halls, school houses, &c., or by drainage.

8. Doctors James B. Tillinghast, John Winsor, G. Louis Wood and Frank B. Smith, are a special board of health; appointed January 26, 1885.

10. No gratuitous vaccination has been provided in this town during the past year, but it will be attended to immediately.

S. W. Griffin.

West Greenwich.

1. No very fatal or very serious disease has prevailed largely.

3. No largely fatal disease occurred among domestic animals.

4. Nothing done for the promotion of public health.

8. No legal board of health beside the town council.

9. No health officers appointed in this town.

10. Gratuitous vaccination has not been provided for in this town during the past year.

W. N. Sweet.

NEWPORT COUNTY.

JAMESTOWN.

1. No very serious disease has prevailed largely.

3. In the south part of the town there has been cholera among the swine on three or four farms, that has been fatal.

4. No unusual work for the promotion of public health by the authorities of the town during the year.

6. No public sewers. Two hotels have run sewers into the salt water.

7. No enactments in abatement of nuisances, or for improvement in heating or ventilating public buildings, halls, school houses, &c., or by compelling the removal of excreta, garbage, house refuse, &c.

8. No legal board of health beside the town council.

9. No health officers.

10. No gratuitous vaccination has been provided during the past year.

John J. Watson.

MIDDLETOWN.

1. There were some cases of diphtheria in this town in 1884, three of which proved fatal. In one case the cause was attributed to imperfect drainage of house cellar. There have been quite a number of cases of scarlatina, most of which were of a mild type and from which no deaths have ensued.

2. There were not any cases of small pox in this town in the year 1884. Have been none for several consecutive years.

3. Domestic animals have enjoyed for the most part exemption from diseases. A few cases of hog cholera were reported. But the infection of swine with this disease was not extended.

4. About the only thing that menaces the health of Middletown to much extent is the bringing, feeding and applying as manure, swill and house offal imported from the City of Newport. An officer was appointed by the town council in April last to look after the operations of swill venders, and to prevent as far as possible the creation of nuisances.

7. No unusual action in abatement of nuisances, or by drainage, or by compelling the removal of excreta, house refuse, &c.

8. We have no legal board of health apart from the town council.

9. We have no health officer unless the Inspector of Nuisances be classed as one. He is responsible to the town council. His name is Nathaniel L. Champlin.

10. No gratuitous vaccination provided during the year.

Albert L. Chase.

PORTSMOUTH.

1. No serious disease has prevailed largely in this town during the last year.

3. Quite a number of hogs have died in the southerly part of the town; disease supposed to be hog cholera.

4. No work for the promotion of public health contemplated by town authorities during the year.

8. No legal board of health beside the town council.

9. No health officers appointed.

10. Gratuitous vaccination has not been provided in this town during the past year.

P. B. Chase.

LITTLE COMPTON.

1. Measles prevailed largely during the last months of the year.

3. No largely fatal disease occurred among domestic animals.

4. No work for promotion of public health contemplated by the town authorities.

8. No legal board of health beside the town council.

9. No health officers in the town.

10. No gratuitous vaccination has been provided during the past year.

F. R. Brownell.

NEWPORT CITY.

1. Scarlatina and whooping cough were very prevalent during the year, but not very fatal or serious.

2. No cases of small pox.

3. No large number of domestic animals sick.

4. The authorities of the city have had under consideration many questions in relation to the promotion of the public health. (See communication of Dr. F. H. Rankin, page 207.) The following extract from the Inaugural Address of Mayor R. S. Franklin, will in connection with the report of the Sanitary Protection Association and the report of Dr. Rankin, furnish the key note to the present advanced sanitary sentiment of Newport City.

SANITARY.

"As I have repeatedly stated, it is essentially necessary to the prosperity and well being of our city, that its sanitary condition should be as near perfect as possible. It is imperative, particularly at this time, with the prospect of the Asiatic cholera in the United States during the present year, that no pains nor expense should be spared in eradicating any and all causes liable to invite its approach in our city. Not only for the protection and preservation of the life and health of our people, is this necessary, but also from a business standpoint, as it is on our reputation as a summer resort that our prosperity in this direction depends. By virtue of the resolution passed December 4, 1884, by the board of aldermen, as the board of health, I have notified Doctors Henry E. Turner and George Engs of their appointment, and they have consented to serve as requested. In conformity to the resolution passed the same evening, authorizing application to be made to the General Assembly for more legislation, if necessary, in relation to sanitary matters, a meeting of the committee was held, and a communication prepared to be presented to the board of health with certain recommendations looking to a more careful inspection of all premises, and a more rigid enforcement of sanitary measures. The General Statutes (in the opinion of the city solicitor) give all necessary power to the board of aldermen as the board of health. It may be necessary to pass additional ordinances relating to this matter. I will not, however, anticipate their report, as it will be presented to the board of health at their first meeting this month; to whom this subject properly belongs. I have alluded to it here to show that proper steps are being taken in relation to the matter.

There will also be presented at the first meeting of the city council, a petition from several citizens for the formation of a separate board of health and asking for an opportunity to be heard in support of their request. I learn from those who have charge of the petition, and are interested in its success, that this plan is not a radical one. I trust that you will give them the desired hearing."

5. The introduction of water from Easton pond for general use, has had considerable extension during the year, and the Water Works Company have expended a large amount of labor and very considerable sums of money, in the improvement of the quality of the water and in the increase of the supply.

6. A special meeting of the city council was called in April, 1884, to consider the report of the City Engineer, Henry A. Bentley, Esq., upon the results of investigations made during the preceding three or four months in regard to the condition and needs of the city in relation to sewerage. At that meeting an appropriation of $20,000 was made for the commencement of the work on the plan presented by the city engineer.

A very concise and comprehensive report* upon the plan proposed was prepared by the city engineer at the close of the year.

7. (See Report of Sanitary Protection Association below.)

8. The legal board of health during 1884 was the board of aldermen, and with, for a part of the year, Drs. H. E. Turner and George Engs as medical advisers. An independent board of health has been appointed for 1885.

9. The health officers for 1884 were: Dr. Henry E. Turner, City Physician; Charles H. Langley, Inspector of Nuisances; Joseph Sherman, Health Officer.

Annual Report of the Sanitary Protection Association of Newport, R. I., for 1883-4.

At the annual meeting of the Association the following report for 1883-4 was presented:—

There is but little to be added to what has already been said in the reports of former years concerning sanitary affairs in Newport, and their condition is not greatly altered, except that a gradual improvement is to be noticed, and that active measures have been taken in regard to a matter of the utmost importance—the adoption of a definite plan of sewerage for the city. During the past year there has been a marked cessation of the excitement with which the questions relating to the drainage and the sanitary state of Newport were discussed in the summer and autumn of 1882, and there has been ample time for those in authority to arrive at calm and dispassionate conclusions upon most of these subjects.

In July last, there was a public hearing before the committee, to which, at the beginning of the summer, was referred the proposition to establish a special board of health. Opinions were freely expressed both in favor of and against the formation of such a board, although many of those who have been especially active in urging its adoption were absent on this occasion, thinking that their views had been often and so emphatically expressed that there was no need of further repetition. The committee having failed to come to a decision at the end of the last year were re-appointed by the present city council, but as yet have not made their report. It is to be regretted that there is considerable opposition to this measure in some quarters; the arguments in its favor need not now be repeated.

In view of possible emergencies which might arise, attention should be directed to the fact that although an ordinance of the City of Newport requires the board of aldermen to appoint a Port Physician every year, no one holds this office, and there is, therefore, no one directly responsible for the discharge of the duties connected with it.

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*Report and Estimates for the completion of the Sewerage System of the City of Newport, R. I. by Henry A. Bentley, City Engineer.

The creation, for the first time last year, of the office of city engineer, which is now combined with that of street commissioner, has been an important step, and those matters in particular which relate to the sewerage of the city have consequently had increased attention given to them. The Committee on Streets and Highways made a special report upon the general sewerage question in March of the present year. The plan proposed by them for adoption has been prepared by the city engineer, Mr. Bentley, and is a modification, (chiefly for reasons of economy and to avoid any litigation which might otherwise arise,) of that proposed by Mr. E. S. Chesbrough, of Chicago, in 1880. In carrying it out, it is intended to construct a main sewer from Ochre Point, to and along Thames Street, thence through Marlborough Street, and across the land of the Railway Company to the foot of Marsh Street. From this locality, it is proposed to continue it through the channel, and by means of a siphon outlet, through the Goat Island breakwater. At a point before the sewage enters this outlet, several hundred feet from the shore, means are to be provided for separating and removing a part, in order to prevent any possible obstruction from taking place. A map has been made of the existing sewers, and it is stated that this system will utilize nearly all of the pipe and brick ones now in use.

A special meeting of the city government, which was attended by a large number of the citizens, was held in April to discuss this plan. The general feeling towards it was favorable, and the board of aldermen passed a resolution approving of and adoping it. This resolution was not passed by the common council, on the ground that it was not expedient until all rights had been secured and all impediments removed, but those members voting against it did not wish to be considered as objecting to the plan itself. The rights referred to were:—The right of crossing the lands of the railway; that of crossing the channel, to be obtained from the General Assembly of the State; and that of passing the breakwater, which it was necessary should be given by Congress. The two former have already been secured, and the latter, also, will probably soon be granted, Colonel Elliot of the United States Engineer Corps, to whom the matter was referred, having reported in favor of giving the required permission. Both boards, however, agreed in appropriating $20,000 to extend the main sewer from Thames Street, at the Parade, to the harbor, at the foot of Marsh Street, and the proposed plan, therefore, at least in its main features, will doubtless ultimately be carried out. By the completion of this sewer, upon which work is now energetically carried on, means of drainage will be supplied for a large section of the city, comprising much of the first ward, which has been hitherto imperfectly provided for. This matter of the sewerage of Newport has been discussed for so many years that, although the entire success of the present plan is, to some extent, problematical, especially in regard to the working of the siphon outlet, the knowledge that active measures have been adopted has created a feeling of general satisfaction. The work of constructiug sewers in particular streets has also been carried on with much activity under the direction of the city engineer, and greatly needed sewers in Washington Street, Gibbs Avenue and elsewhere have been, or now are, in process of construction.

In regard to the city water, much labor and money have been expended by the Water Works Company to improve its quality, although their efforts have been mainly directed towards raising the level of that part of Easton's Pond

from which the supply comes, a proceeding which Professor Pumpelly, in his report to the Association, could not consider advisable. There is reason to believe that sufficient care is not yet taken to guard it from all external causes of pollution. The works at the Hanging Rock pond have been completed and it is now available as an additional source.

Special efforts have been made to secure the purity of the ice supply, much stress having been laid by this Association upon the possibility of disease resulting from the use of ice obtained from impure waters.

There has been, on the whole, no unusual amount of illness during the year, but there has been a larger proportion of cases of typhoid fever than could be expected if sanitary conditions were more satisfactory. Attention has lately been called to serious defects in the Thames Street school and surroundings, but the evils in this case will, no doubt, be promptly remedied.

The Circular Letter No. 1 of the Association being nearly out of print, it was determined to republish it in a revised form. The work of revision was performed very carefully, and before the letter was finally issued it was submitted for suggestions to the Newport Medical Society and a number of physicians at that time in the city, as well as to many others interested in sanitary matters. The result was that numerous suggestions were made and adopted, and it is thought that in its present form the letter will prove to be very useful and well worthy of the careful consideration of all householders and also of those occupying dwellings for only part of the year.

The valuable reports made for the Association upon the water supply by Prof. Pumpelly, and the sanitary condition of Newport by Mr. Bowditch, of which mention was made in last year's report were published in several numbers of the Sanitarian for July, 1883. With the latter paper also appeared reduced copies of the more important charts which originally accompanied it.

A report has recently been sent to the Secretary of the Navy by Surgeon J. B. Parker, U. S. N., corroborating the views of the Association, and making special reference to the bad condition of the inner harbor and its effect upon the health of those living at the Torpedo Station—which state of affairs, however, it is expected will be remedied by the proposed main sewer.

The efforts of the Association to induce the large number of persons renting houses to inform themselves of the condition of the premises they occupy, will not, it is hoped, prove to have been in vain.

Several of the prominent members have unfortunately been prevented this year from taking an active part in its proceedings, but notwithstanding that the attendance has been occasionally small, the meetings have been regularly held each month since the foundation of the Association.

The inspection of dwellings continues to be made whenever desired, and although it is not always agreeable to be told of defects, particularly when they are found in a house where pains have been taken for its sanitary condition, this should rather be looked upon as a guarantee of the care of the inspectors to give an honest and unprejudiced opinion.

Comparatively little success has been attained in inducing the permanent residents of Newport to become members, although it might naturally be considered that it was for their especial advantage to do so, and notwithstanding the fact that the price of membership, with the privilege of having an inspection

made, is purposely fixed at a very moderate sum, to enable many who could not easily afford the ordinary price of inspection by a sanitary engineer, to have their houses examined.

The Association is now in the sixth year of its existence and is no longer aided by the influence of novelty which often causes a temporary interest to be taken in new projects, but, in spite of opposition, it has stood the test of time, and continues to appeal to the sober sense and reason of the community. As stated in the Annual Report for 1879-80:—"It is not intended as a substitute for municipal inspection, nor will it conflict with the action of the public authorities, but it solely wishes to assist them in their protection of every citizen."

It is gratifying to note that the City Physician, who is also the chairman of the State Board of Health, and who is in a position to judge accurately of the public feeling on these questions in Newport, says in the sixth Annual Report of the Board, lately published: "There is a general advance in public sentiment in favor of sanitary arrangements and a great deal of attention and large expenditures are given to their perfection."

It can hardly be doubted that the Sanitary Protection Association, by greatly promoting this advance in public sentiment which has now resulted in the practical adoption of a plan of sewerage, has done much for the welfare of Newport, and that, if looked upon in a more friendly light by the city government, it will be of equal or even greater value in the future.

William C. Rives, Jr., M. D.
Recording Secretary.

Newport, July 8th, 1884.

PROVIDENCE COUNTY.

BURRILLVILLE.

1. No disease has prevailed largely in this town during the last year.

3. The swine were affected with hog cholera last autumn, in vicinity of Pascoag and Harrisville.

4. Not any work for the promotion of public health has been contemplated, but having no very thickly settled localities, the general health of the population has been very good.

7. No ordinances in relation to abatement of nuisances, drainage or removal of garbage, etc.

8. No legal board of health beside the town council.

9. No health officers appointed in this town.

10. Gratuitous vaccination has not been provided in this town during the past year.

Alvah Mowry.

Cranston.

1. Do not know of any very serious disease that has prevailed largely in this town during the last year, except from malaria.

4. Some attention given by town council to nuisances, and appointment of health officers. (See ordinances below.)

5. No introduction of water for general use.

6. No public sewers.

8. There is a board of health, D. Homer Batchelder, superintendent of health.

9. We have health officers as above stated.

10. Gratuitous vaccination has been provided in this town during the past year.

J. M. Wheeler.

ORDINANCES OF THE TOWN OF CRANSTON.—CHAPTER XIV.

BOARD OF HEALTH.

Section 1. It shall be the duty of the board of health or one of its members or the superintendent of health by the board authorized to examine into the state and condition of every place in and every part of the town where it shall suspect or be informed that there exists any matter or thing which is or may be prejudicial to the health of the inhabitants thereof.

Sec. 2. Whenever it shall appear to the satisfaction of the board of health or of a member of the board or the superintendent of health authorized to act, that there exists upon any premises any dirt, filth or offal, or animal or vegetable matter, or the contents of any hog-pen, hen-house, privy, drain or vault liable to injure health, or by obnoxious smell to annoy the neighborhood, it shall be the duty of said board or of the member authorized to act to cause the owner or occupant of said premises to be notified of the existence of such nuisance or annoyance, and be directed forthwith to abate the same, and if such nuisance or annoyance shall not be abated within twenty-four hours after such notice, the officer giving such notice shall be authorized to cause such nuisance or annoyance to be abated or removed at the expense of the town, and the owner or occupant of such premises shall forfeit and pay in addition to the actual expense of abating such nuisance or annoyance a sum not less than ten nor more than twenty dollars, for which, together with the penalty aforesaid, the owner or occupant shall be liable, and the same shall be collected for the use of the town by proper legal process before any court of competent jurisdiction.

CHAPTER XV.

CONCERNING NUISANCES.

Section 1. No person shall bring or cause to be brought into this town any part of the contents of any privy-vault, cesspool or slaughter house offal, or other offensive matter without first obtaining a license from the town council for that purpose, the number of said license to be placed on the vehicle used to convey said matter.

Sec. 2. No person shall, between the first day of May and the first day of November in any year, carry into or through any public highway or street in this town any part of the contents of any privy-vault, cesspool, slaughter house

offal or other offensive matter in any cart, wagon or other vehicle except between the hours of ten o'clock P. M., and sunrise, except the same is done in compliance with the next section.

SEC. 3. No person or persons shall at any time whatsoever carry into or through any public highway or street in this town any part of the contents of any privy-vault, cesspool, slaughter house offal or any offensive matter in any cart, wagon or other vehicle, or tubs, which shall not be effectually covered and water-tight.

SEC. 4. No cart, wagon or other vehicle having therein any part of the contents of any privy-vault, cesspool, slaughter house offal or any offensive matter, shall be permitted to stand (except while loading) in any public street or highway in this town.

SEC. 5. Whenever any person shall convey into this town the contents of any privy-vault, cesspool, slaughter house offal or other offensive matter, to the extent that it becomes a nuisance or obnoxious, or cause the same to be done by others, it shall be the duty of the board of health to have served a written notice upon the person or persons causing the same, ordering him or them to forthwith discontinue the same, and if said order is not complied with within twenty-four hours, said council shall revoke his or their license if he or they have any, and a further penalty shall be imposed by a fine of not less than five nor more than twenty dollars.

SEC. 6. When any person shall make complaint to any police officer or police constable of this town, or when any such police officer or constable shall discover upon any premises in this town any offal, or vegetable, or animal matter in a state of decomposition, or the contents of any barn, cow yard, manure heap, hog-pen, hen-pen, privy, sink or other drain, cesspool or vault, noisome or injurious to the health of the neighborhood, it shall be the duty of such police officer to notify a health officer of this town of the same, who shall examine the premises, and if, in his opinion, the same is injurious to the health of the neighborhood, said health officer shall cause the party maintaining the same to be notified in writing of the existence of such nuisance, and that said owner or occupant must forthwith abate such nuisance. If any such nuisance shall not be removed or abated within twenty-four hours after such notice, said owner or occupant shall, for each and every day such nuisance shall remain, pay a fine of not less than two dollars nor more than twenty dollars.

SEC. 7. Any person who shall have any horse, ox, mule, cow, bull, sheep, dog, or any other animal die in this town, or who shall bring or cause to be brought into said town, the dead body of any of the aforesaid animals, shall bury or cause the same to be buried within twenty-four hours after the death of such animal, so that every part of the said animal shall be at least three feet below the surface of the ground where such animal shall be buried. Any person who shall violate the provisions of this chapter shall be fined not less than five dollars nor more than twenty dollars, or be imprisoned not exceeding ten days.

SEC. 8. No person shall establish or maintain any soap works or other place for the boiling of fat, bones, refuse matter of any kind in any compact part of this town without license, first had and obtained from the town council, and for each and every day such nuisance shall remain after notice from the town coun-

cil to abate the same, the person or persons maintaining the same shall be fined not less than five nor more than twenty dollars.

SEC. 9. Any violation of any of the provisions of this chapter (wherein the same is not already prescribed in its provisions) shall be punished by a fine of not less than two nor more than twenty dollars.

In Town Council, Dec. 30, 1884.

CUMBERLAND.

1. Have no knowledge of any very fatal disease that has prevailed largely during the last year.

3. No largely fatal disease occurred among domestic animals.

4. No work for the promotion of public health has been contemplated by the town authorities during the year to my knowledge,

5. No introduction of water for general use.

8. No legal board of health beside the town council.

9. The health officers are Dr. George B. Haines, Dr. Lucius F. C. Garvin, Dr. Thomas J. Smith.

10. No gratuitous vaccination has been provided.

H. A. FOLLETT.

FOSTER.

1. No very serious disease has prevailed largely to my knowledge during the last year.

3. No fatal disease occurred among domestic animals.

4. Nothing done for the promotion of public health.

8. No legal board of health beside the town council.

9. No health officers appointed in this town.

10. Gratuitous vaccination has not been provided during the past year.

LESTER HOWARD.

GLOCESTER.

1. No very serious disease has prevailed largely during the last year.

3. No largely fatal disease has occurred among domestic animals.

4. No work for the promotion of public health by the authorities of the town during the year.

8. No legal board of health beside the town council.

9. Richard Barnes appointed by the council health officer.

10. Gratuitous vaccination has not been provided in this town during the past year.

C. W. FARNUM.

JOHNSTON.

1. No very fatal disease the past year that prevailed largely.

3. No fatal disease occurred among domestic animals.

4. No particular work for the promotion of public health has been commenced or completed by the authorities of the town during the year.

5. Pawtuxet water is generally used in the compact part of the town known as Olneyville.

6. No sewers constructed during the year.

7. We have in this town a corps of health officers appointed by the town council annually, and duly qualified as required by statute, whose duty it is to enforce the provisions and requirements of the town ordinances in relation to nuisances, and to prosecute any violation of the provisions of said ordinances that shall come to the knowledge of each officer, and I believe that all such violations that have come to the knowledge of said officers have been promptly and effectually dealt with.

9. The health officers are Charles A. Barnard, M. D., Thomas C. Lawton, M. D., Elmer B. Eddy, M. D., Wm. A. Carroll.

10. No gratuitous vaccination has been provided. The subject of free vaccination has been agitated in the town council but no definite action has yet been taken.

Wm. F. King.

LINCOLN.

1. No very serious disease prevailed largely in this town during the last year.

3. No widely spread disease occurred among domestic animals in the town during the year.

4. No work for the promotion of public health was contemplated, commenced or completed.

5. Abbott Run Water supplied by the town of Pawtucket; about nine-tenths of the compact part of the population are supplied.

6. No sewerage system.

7. Nuisance ordinances generally enforced.

8. No legal board of health beside the town council.

9. The health officers are Samuel L. Pendergrass, Andrew J. Patt, Nathaniel Spaulding, Simon A. Sayles, Frank Millett, Carlisle Vose and Samuel Fessenden.

10. No provision made for free vaccination.

Wm. H. Gooding.

North Providence.

1. No very serious disease has prevailed largely in this town during the last year.

3. No widely spread disease occurred among domestic animals in this town during the year to my knowledge.

4. No work for the promotion of public health has been contemplated by the authorities of the town during the year.

5. No water introduced as yet but we are in hopes of having a reservoir built by the city on Fruit Hill.

6. No sewers.

8. No legal board of health beside the town council.

9. Health officers appointed this year, 1884, Randall M. Tallman, Charles N. Jayne.

10. No gratuitous vaccination has been provided during the past year.

THOMAS H. ANGELL.

NORTH SMITHFIELD.

1. Do not know of any very fatal or very serious disease that has prevailed largely in this town during the last year.

3. "Hog cholera" has been quite prevalent in south part of town, occurring late in the fall.

4. No work for the promotion of public health has been contemplated or completed in this town during the year.

5. No introduction of water for general use.

7. More attention has been paid to cleaning up waste matter than in former years, especially in the villages.

8. No legal board of health beside the town council.

9. No health officers appointed in this town.

10. No gratuitous vaccination has been provided during the past year.

B. A. ANDREWS.

PAWTUCKET.

1. No very dangerous disease has largely prevailed in this town during 1884.

3. No very fatal disease among useful animals.

4. The town authorities have been quite active in regard to means of preserving the health of its citizens by various means, as by extension of water mains or pipes and promoting increased use of Abbott Run water, by action in relation to a system of sewerage, abatement of nuisances, &c. (See Report of Pawtucket in State Board of Health Report for 1883).

6. From March 21, 1884, to Jan. 3, 1885, there has been laid $3\frac{67}{100}$ miles of pipe sewers and $1\frac{25}{100}$ miles of brick sewers; a total of $4\frac{92}{100}$ miles.

Of the total amount, 9920 feet, of brick sewers recommended in their report,* there has been constructed the past year 6622 feet, or 67 per cent. of the total. There remains to be constructed to complete the brick sewers in the districts covered by this report but 3198 feet, and of the total amount of all the pipe sewers, there has been laid about 16 per cent. and of all the sewers to be laid about 20 per cent. has been laid.

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*Report of the Committee on Sewers, Pawtucket, 1884–5.

The town council in December passed an ordinance to take effect the first day of January, A. D. 1885, establishing a Sewer Department and a Board of Sewer Commissioners, also defining the duties of said board.

9. The health officers during 1884 were Geo. H. Stanley, M. D., John Brierly, Seabury S. Tompkins and Edward Card.

ALDEN SIBLEY.

SCITUATE.

1. No very serious disease has prevailed largely during the last year.

3. No fatal disease has occurred among domestic animals.

4. No work for the promotion of public health has been contemplated by the authorities of the town during the year.

7. No abatement of nuisances or other improvement.

8. No legal board of health beside the town council.

9. No health officers in town responsible to town council.

10. No gratuitous vaccination has been provided in this town during the past year.

D. H. REMINGTON.

SMITHFIELD.

1. Do not know of any very fatal disease that has prevailed largely during the last year.

3. No largely fatal disease occurred among domestic animals.

4. Nothing for the promotion of public health has been contemplated by the authorities of the town during the year.

7. No abatement of nuisances.

8. No legal board of health beside the town council.

9. Health officers have not been appointed.

10. No gratuitous vaccination has been provided during the past year.

OSCAR A. TOBEY.

WOONSOCKET.

1. No very fatal or serious disease has prevailed largely in this town during the last year.

3. I have made inquiries of veterinary surgeons, and am informed that there has been none; in fact more free from any than is usual.

5. Water has been introduced by a private company; it is being taken by the people but not yet generally, owing to the lateness of introduction. The source of supply is Crook Fall Creek. It is claimed that the supply is abundant.

6. No new sewers constructed.

7. Nothing new in the abatement of nuisances or by improvement in heating or ventilating public buildings, halls and school houses, or by compelling the removal of garbage, house refuse, &c.

8. Only have health officers subject to council.

9. Health officers—Gilbert L. Staples, Chairman; Wm. C. Monroe, M. D., Clerk; Godfroy Daigneault.

10. The school committee have been authorized to have children of school age properly vaccinated when needed.

ALBERT E. GREENE.

PROVIDENCE CITY.

1. The following extract from the Report of the Superintendent of Health, will show to what extent several important diseases have prevailed during 1884:

"The following is a table of the contagious diseases reported during the year. The first column indicates the number of cases, the second column the number of deaths

	Cases.	Deaths.
Scarlet fever	588	57
Typhoid fever	122	52
Diphtheria	193	57
Measles	195	7

MALARIA.

Malarial disease still continues in Providence, and has appeared in some sections hitherto exempt, notably in the vicinity of Cunliff's pond, near the Cranston line. On each side of Acorn street. near the railroad, intermittent fever was very prevalent during the fall months, much more so than it has ever been before. Other parts of the city which have previously suffered, had about the same number of cases as in former years. It usually happens during the progress of malaria, for the first year or two that all the cases are of the regular intermittent type, but when it has prevailed for two or three years "dumb ague" and masked forms appear. This has been the case in Providence. On the whole it may be said that malarial disease has somewhat increased during the last year. But still it only prevails in those sections of the city that are built on a moist soil or are in the immediate vicinity of shallow ponds or swamps. The only way to free ourselves from malaria is get rid of these conditions, and the means for accomplishing this will be spoken of in another part of this report."

3. No unusual disease or any disease largely fatal among domestic animals, has prevailed.

4. A great deal of work for the promotion of public health was performed during 1884, and a great deal is now in contemplation. The Superintendent of Health reports:

"During the year, all premises within the city, except in a few outlying districts, have been inspected at least once. One inspector was employed all the time, and another for three months. As there are 15,684 dwelling houses, besides other buildings, it will be seen that the labor was very great. With the

limited amount of assistance, it was only possible in most cases, to examine into the condition of the yard, vault, cesspool, etc. But when special complaint was made, and in cases of diphtheria and typhoid fever, special examination was made of the interior of the houses, of the cellar and of the plumbing. The result of these inspections shows that in a majority of the houses in this city the plumbing and drainage is dangerously defective, so that sickness has, in a large number of instances, resulted. The cause of the poor plumbing is to be attributed sometimes to the parsimony of landlords, but more often to their ignorance and a reckless underbidding on the part of contractors. Poor plumbing with its attendant evils, can be almost entirely avoided by a good plumbing law and a faithful inspection, both of which are much needed. With the exception of the vaults, and cesspools, and the plumbing, the condition of the dwellings of Providence is unusually good. Landlords, as a class, keep their houses in repair, and tenants are careful and cleanly. Still there are certain districts where the houses are old, and the inhabitants poor and mostly of foreign birth, which are in a filthy condition. While these places are not numerous, there are enough of them to require considerable attention from this department. It is a difficult problem to know what to do with them, for the chief difficulty is with the occupants themselves, who prefer filth to cleanliness, and who have no regard whatever for the rights and property of the landlords. They can be turned out of doors, but they must live somewhere, and if they move to a new and clean house they usually put it, in a short time, in as bad a condition as was the place which they left. The only course seems to be to follow up both landlords and tenants and keep them continually repairing and cleaning.

Nuisances were reported during the year on 2,518 premises, and were of the character shown in the table on a subsequent page. In many cases there were several forms of nuisance at one place, and often the same place, though repeatedly put in order, would again and again be found in bad condition.

As will be seen by the table, the chief causes of nuisance are privy-vaults and cesspools. A vault, at its best, is an abomination, and a cesspool is not much better. A privy-vault, when built water-tight and properly covered and cleaned once or twice a year, yet pollutes the air and is thus directly injurious to health, and, moreover, is an agent for the spread of typhoid fever, cholera, and perhaps other specific diseases. Moreover, the mere operation of cleaning, as here conducted, is a nuisance. Unless the vault is disinfected frequently, say once a week in the summer, all the evils are much increased, and very few persons do thus disinfect their vaults. Not more than five per cent. of the vaults are properly constructed. Many of them are not covered, thus giving free egress for foul gases, which often escape into the bed-room and dining-room of a neighbor. Too often the vault is made the receptacle for all sorts of garbage and rubbish, which makes it more offensive than ever. The vast majority are not water-tight, but are built with the express purpose of allowing their contents to leach away. Thus the soil for a large space around the privy becomes saturated with filth, which often makes its way under foundations and into cellars. In this way the pollution of the air is increased, and the offensive gases find their way into dwellings. Moreover, if a well is the source of water-supply, as it too often is, there is great danger, nay, almost a certainty of its becoming fouled by percolation from the vault. Bad as is a water-tight vault, the leaching vault is far

worse. Yet there are still a large number of persons who believe that a hole in the ground with a privy set over it is the best possible arrangement, and far superior to the most approved water-closet with a sewer connection. While municipal action cannot be far in advance of public opinion, it is one of the functions of sanitary rules to instruct as well as to restrain. The board of health should use every effort to induce house-owners to remove vaults when possible, and where they are necessary to cause them to be built properly and to be kept clean and well disinfected. Where opposition is met with, attention to these matters must be enforced.

Cesspools are almost as bad as vaults. While the filth in them is not quite as concentrated and dangerous as in vaults, and while from the fact that they are usually covered up with earth they do not pollute outside air, yet, through the facilities offered by poor plumbing, they usually send all the gases of decomposition into the interior of dwellings, and thus become the frequent sources of disease. The practice of using abandoned wells as cesspools is a bad one, and should in no case be allowed. When a well is thus used, the filth is carried at once into the stratum of ground water, and is borne to long distances, often polluting other wells that are used for drinking. At such a depth, oxidation of the filth must be extremely slow. In other cities, where the practice has been very common, it is often found in making deep excavations that the soil, in the compact part of the city, is completely saturated with filth, and is extremely offensive. If wells are used as cesspools, the same conditions will be gradually developed here. It is more difficult to know how to deal with cesspools than with privy-vaults, for if they are made water-tight, the expense of cleaning them is very burdensome, and even if they are not made water-tight, in time the soil becomes so clogged that water can no longer leach away, and we have a cesspool made water-tight by a cement of filth. When several millions of gallons of water are daily pumped into a city, and rendered foul by domestic use, it must, in some way, be gotten out again. A system of sewers is the only rational and complete remedy, and sewers should certainly be extended over the thickly settled portions of the city as rapidly as our finances will allow. Wherever there are sewers, all vaults and cesspools should be removed. Where there are no sewers, the vaults and cesspools should be under the constant supervision of this department, and should be reconstructed, when faulty, and be kept clean and well disinfected.

The following table exhibits the number of nuisances reported and examined during the year 1884:

Privy-vaults full and offensive	1,547
Cesspools full and offensive	300
Defective drains and waste-pipes	249
Filthy yards	306
Defective vault or absence of vault	119
Uncovered vaults and cesspools	116
Absence of cesspool	109
Filthy cellars	55
Untrapped fixtures	78
Cesspools or vaults leaking into cellars	46

Cesspools or vaults leaking on to next estate	15
Filthy water flowing into street	34
Houses unfit for occupancy	13
Old wells used as vaults or cesspools	18
Defective water-closets	10
Depositing night-soil within city limits	10
Privies over the river	39

5. In relation to water supply for general use, the following extract from Mayor Doyle's seventeenth Inaugural Address is presented.

THE WATER WORKS.

In my last annual message I referred to the fact that careful attention was being given to the matter of purification of the Pawtuxet river from whatever impurities might enter it from any source. This work has been carried on during the past year with satisfactory results in making negotiations with nearly all the parties on the banks of the river from whose premises impurities might flow into the stream.

The total length of water pipes of all sizes laid since the commencement of the water works is 184½ miles, of which nearly 7 miles was laid during the past year. There are now in service, including 8 post hydrants, 1,224 hydrants, 15 of which were set during the same time.

The average daily consumption of water in gallons during the summer months of the last five years is as follows:

1880.	1881.	1882.	1883.	1884.
4,385,000	4,109,000	4,610,000	5,024,000	4,376,000

The average daily consumption of water in gallons, including eleven months of 1884, during the last five years, is as follows:

1880.	1881.	1882.	1883.	1884.
3,547,000	3,717,000	3,665,000	4,144,000	4,092,000

The largest amount of water consumed in any one day during the past year was 6,144,000 gallons, being 900,000 gallons less than in any day in 1883.

The cost of the water works to the city from its commencement to the close of the last fiscal year, September 30, 1884, may be stated as follows:

Total amount paid for construction	$5,328,112 83
Total amount paid for maintenance	754,015 71
Total amount paid for interest, premium and discount	3,489,310 63
Whole total	$9,571,439 17

The receipts have been:

From water rents	$2,606,546 97
From all other sources	473,725 14
Total receipts	3,080,272 11
Total net cost	$6,491,167 06

The receipts for water rents continue to show a satisfactory increase. The sum received for the fiscal year 1884 was $28,610.77 in excess of the receipts for the fiscal year 1883, being nearly twice as much as the increase in 1883 over the preceding year.

But little real progress has been made during the past year in arranging for a supply of water for the large district of territory in the first and tenth wards, the inhabitants of which have none of the benefits of the water supply enjoyed by the other citizens, except the pleasure of being taxed for the privileges denied to them. This injustice should be remedied as soon as practicable.

6-7. From the Report of the Superintendent of Health:

SEWERAGE AND RIVER POLLUTION.

To secure a "pure air, a pure water and a pure soil," is the great purpose of hygiene. A good water-supply has been obtained for this city, but as yet the work of securing the other two requisites of healthful life has been only partially accomplished. An atmosphere polluted in any way cannot be as healthful as pure air, and when the sources of pollution are decomposing organic matter, the impurities not only injure the health in a general way, but also directly cause certain specific diseases. An impure and filthy soil gives its impurities to the air, and also to the water-supply, if wells are its source. It is now known that, owing to the artificial warmth of our houses, there is a constant current of air ascending into them from the soil and immediately around and beneath them. Thus the impurities in the soil find their way directly into our dwellings. The only way to obtain a pure and healthful air and soil, is to remove every putrescible substance from the city before it has time to decompose. The garbage is now satisfactorily removed by the contractors. The streets are kept clean by the board of public works. Excrement and liquid filth are only satisfactorily removed by sewers. Where there are no sewers, this material is retained in vaults and cesspools. These, even when constructed in the best way and properly cared for, are a great evil, for each one is a centre of pollution, certainly of the air, and usually of the soil.

The ordinary water-carriage system of sewerage was years ago decided to be the best for this city. Such a system has been begun, and as far as it has been extended, is well carried out. A system of sewers will, in connection with scavenging and street-cleaning, remove all putrescible material, and maintain a pure air and pure soil, and it is only in this way that these results can be obtained. There are at present 49.41 miles of sewers, and 3,937 sewer connections, providing, probably, for the drainage of a little over 4,700 houses. As there are 15,684 dwelling houses in the city, it is seen that the inhabitants of two-thirds of these do not enjoy any of the immediate benefits to be derived from the sewers.

The health and comfort of these people demand the speedy construction of more sewers. Of the entire population, only 36,421 had, on June 1, 1884, the benefit of a sewer connection at their dwelling place. While a portion of our population live in suburban sections where sewers cannot for many years be built, yet it is estimated that nearly 60,000 live on streets where sewers might well be constructed. The cost of sewers is very great, but they give a return in health and life, the money value of which cannot be calculated. That good sewerage does preserve health and life is shown by the improved sanitary condition of scores of cities, here and abroad.

8. There is no legal board of health in the city of Providence, beside the Board of Aldermen.

9. Dr. C. V. Chapin, Superintendent of Health.

10. Gratuitous vaccination is provided for every Saturday at the City Hall, except during July and August.

C. H. Fisher, M. D.

CHARLESTOWN.

1. No diseases very fatal or very serious have prevailed to an unusually large extent in this town during the last year.

2. No cases of small pox during the year.

3. No widely spread or largely fatal disease occurred among domestic animals in the town during the year.

4. No work for the promotion of public health contemplated by the authorities of the town during the year.

5. No introduction of water.

7. No act in abatement of nuisances.

8. No legal board of health beside town council.

9. No health officer appointed.

10. Gratuitous vaccination has been provided for by the town council and performed by Geo H. Beebe, M. D., at the district school houses.

George C. Cross.

EXETER.

1. No very serious disease has prevailed in this town during the last year.

3. No largely fatal disease occurred among domestic animals.

4. No work for the promotion of public health has been contemplated.

7. No abatement of nuisances.

8. We have no legal board of health beside the town council.

9. No health officers.

10. Gratuitous vaccination has not been provided in this town during the past year.

N. B. Lewis.

HOPKINTON.

1. No very serious disease has prevailed largely during the last year.
3. No largely fatal disease occurred among domestic animals.
4. No work for the promotion of public health has been contemplated.
7. Nothing in the way of abatement of nuisances.
8. No legal board of health beside the town council.
9. No health officers in this town.
10. Gratuitous vaccination has not been provided during the past year.

E. R. ALLEN.

NORTH KINGSTOWN.

1. Do not know of any very fatal or very serious disease that has prevailed largely.
3. Hog cholera to small extent.
4. No work for the promotion of public health has been contemplated by the authorities of the town during the year.
8. No legal board of health beside the town council.
9. No health officers appointed in this town.
10. No gratuitous vaccination has been provided in this town during the past year.

JOHN B. PEIRCE.

SOUTH KINGSTOWN.

1. Scarlet fever has prevailed considerably.
3. There have been cases of cholera amongst swine.
4. No work for the promotion of public health has been contemplated by the authorities of the town during the year.
8. No legal board of health beside the town council.
9. John R. Wilcox, Health Officer, Kingston, R. I.
10. Last vaccination in 1883.

J. G. PERRY.

RICHMOND.

1. No very fatal or serious disease has prevailed largely.
3. No largely fatal disease occurred among domestic animals.
4. No work done for the promotion of public health.
8. No legal board of health beside the town council.
9. No health officers appointed in this town.
10. No gratuitous vaccination during the year.

HALSEY P. CLARKE.

WESTERLY.

1. No very serious disease has prevailed largely in this town during the last year except scarlet fever.

3. Hog cholera to a small extent.

4. No work for the promotion of public health has been contemplated by the authorities of the town during the year.

7. Town ordinances same as sent last year.

8. No legal board of health beside the town council.

9. Benjamin York, Health Officer.

10. Gratuitous vaccination has not been provided in this town during the past year.

WM. HOXSEY.

METEOROLOGY.

Somewhat extended remarks in relation to the meteorology of Rhode Island, have been made in previous reports of the Board, to which reference may be made for ascertaining the seeming results, and comparisons, of observations taken at different places in the State, during the same year, and in different years.

On the following pages will be found tabulated observations taken at Hope Reservoir and at the City Hall in Providence, during 1884, the first table showing the temperature with the daily ranges in each month, with monthly precipitation of moisture and prevailing direction of the wind.

The second table will give a comprehensive monthly summary of observations during 1884, including a larger number of atmospheric conditions for each month, and also yearly summaries for each of the three preceding years.

Many thanks are due the City Engineer and his assistants for their kindness and courtesy in furnishing these valuable tables.

CITY ENGINEER'S OFFICE, PROVIDENCE, R. I.

Temperature, Rainfall and prevailing direction of the wind, for each month during the year 1884.

1884.	TEMPERATURE.							Total amount of Rain or Melted Snow in inches.	Prevailing Direction of the Wind.
	Monthly Mean.	Maximum.	Minimum.	Monthly Range.	Greatest Daily Range.	Least Daily Range.	Average Daily Range.		
January	24.3	48.5	0.	48.5	39.	6.5	16.8	5.83	S. W.
February	32.8	57.	2.5	54.5	33.5	8.5	17.7	7.29	Variable
March	34.3	61.5	5.	56.5	44.	7.	15.7	5.48	N. W.
April	44.3	69.	30.	39.	23.	3.5	14.3	4.97	N.
May	56.5	88.	35.	53.	36.	10.	19.8	3.85	S. N. W. Variable
June	68.8	94.	40.	54.	38.	7.5	21.8	4.66	Variable
July	69.6	88.5	55.	33.5	28.5	11.	18.8	3.70	N. W.
August	70.1	89.	48.5	40.5	33.	6.5	17.3	4.86	S.
September ...	66.6	93.	42.5	50.5	27.	5.5	19.6	1.48	Variable
October......	53.	81.	29.	52.	35.5	6.	18.6	3.30	S. W.
November....	41.	60.5	22.	38.5	30.5	8.	16.2	4.28	N. W.
December....	32.2	59 5	*-10.	69.5	59.	5.	17.1	7.80	N.

Mean temperature for the year 1884, was 49.5 Fah. Total amount of rain or melted snow, 57.50 inches.

* Below zero.

NOTE.—The maximum and minimum thermometers are not read on the Sabbath; therefore the daily ranges were computed, considering the reading from Saturday to Monday as one.

CITY ENGINEER'S OFFICE, PROVIDENCE, R. I.

SUMMARY OF METEOROLOGICAL OBSERVATIONS.

AT HOPE RESERVOIR AND CITY HALL FOR THE YEAR 1884.

MONTHS.	BAROMETER. Reduced to Sea Level, and to 32°.				THERMOMETERS.				Relative Humidity.	WIND. Prevailing direction. No. of days it was									WIND.	WEATHER. Atmosphere. No. of days it was					WEATHER.	RAIN AND SNOW.	
	Mean.	Maximum.	Minimum.	Range.	Mean.	Maximum.	Minimum.	Range.	Mean.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.	Variable.	Mean velocity.	Clear.	Fair.	Variable.	Rain or Snow.	All others.	Mean amount of Cloud.	Amount of Rain or Melted Snow in inches.	Depth of Snow in inches.
January	30.09	30.79	29.14	1.65	24.3	48.5	0.	48.5	75	7	1	1	0	1	10	2	7	2	10	5	10	2	13	1	5.8	5.83†	5.00
February	30.05	30.79	28.93	1.86	32.8	57.	2.5	54.5	84	5	3	0	1	2	3	1	5	9	10	0	9	2	18	0	7.6	7.29†	16.50
March	29.98	30.42	29.43	.99	34.3	61.5	5.	56.5	74	7	0	1	2	3	3	3	8	4	11	3	7	3	18	0	6.3	5.48†	2.00
April	29.79	30.17	28.97	1.20	44.3	69.	30.	39.	77	9	3	0	3	0	1	0	7	7	11	4	11	1	14	0	6.2	4.97†	6.00
May	29.92	30.32	29.46	.86	56.5	88.	35.	53.	72	1	2	1	2	7	2	2	7	7	11	1	13	1	15	1	5.3	3.85	..
June	30.07	30.53	29.75	.78	68.8	94.	40.	54.	70	2	5	1	0	5	7	2	0	8	8	9	8	3	9	1	3.4	4.66	..
July	29.82	30.04	29.52	.52	69.6	88.5	55.	33.5	76	2	2	1	1	6	5	3	7	4	9	0	14	1	15	1	5.4	3.70	..
August	30.05	30.34	29.71	.63	70.1	89.	48.5	40.5	83	4	1	2	3	8	4	0	2	7	7	1	14	2	14	0	5.6	4.86	..
September	30.08	30.45	29.70	.75	66.6	93.	42.5	50.5	76	2	3	0	0	5	6	2	3	9	7	2	17	3	6	2	3.5	1.48	..
October	30.10	30.58	29.64	.94	53.	81.	29.	52.	72	5	1	0	2	2	8	1	7	5	9	3	7	3	15	3	4.6	3.30	..
November	30.04	30.50	29.27	1.23	41.	60.5	22.	38.5	71	4	1	1	0	3	5	5	6	5	9	6	9	3	11	1	4.1	4.28†	1.00

December..........	30.04	30.72	29.49	1.23	32.2	59.5	-10.	69.5	77	9	0	0	0	0	6	6	4	6	9	2	8	2	18	1	6.	7.80†	14.00
Means for the year..	30.00	....	....	1.05	49.5	....	....	49.2	76	..	..	..	..	..	..	..	..	..	9	..	..	..	..	..	5.3	....	..
Totals for the year.	....	...	....	....	....	....	....	....	....	57	22	8	14	42	60	27	63	73	....	36	127	26	166	11	..	57.50	44.50
Extremes	....	30.79	28.93	1.86	....	94.	-10.	104.	....	..	..	..	..	..	..	..	..	..	....	..	..	..	..	..	..	....	..

Yearly Summary for 1883.

Means for the year.	30.05	....	....	1.08	48.2	....	....	45.5	72	..	..	..	..	..	..	..	..	..	2.2	..	..	..	..	..	5.1	....	..
Totals for the year.	....	....	....	....	....	....	....	....	....	43	31	7	11	44	51	35	70	73	....	45	136	17	156	11	..	45 71	73.00
Extremes	....	30.77	28.88	1.89	....	93.	-9.5	102.5	....	..	..	..	..	..	..	..	..	..	....	..	..	..	..	..	..	....	..

Yearly Summary for 1882.

Means for the year..	30.03	....	....	1.03	49.2	. ..	....	46.	72	..	..	..	..	..	..	..	..	..	2.2	..	..	..	..	..	5.3	....	..
Totals for the year..	....	....	....	....	....	....	....	....	....	54	26	2	16	46	39	40	82	60	....	44	148	31	136	6	..	51.84	74.00
Extremes	....	30.79	29.22	1.57	....	95.	-11.	106.	....	..	..	..	..	..	..	..	..	..	....	..	..	..	..	..	..	....	..

Yearly Summary for 1881.

Means for the year..	30.00	....	....	1.08	49.6	....	....	44.5	73	..	..	..	..	..	..	..	..	..	2 15	..	..	..	..	..	5.1	....	..
Totals for the year..	....	....	....	....	....	....	...	....	....	47	33	12	9	50	47	20	80	67	....	80	73	54	130	28	..	52.96	27.50
Extremes	....	30.80	28.97	1.83	....	96.	-4.	100.	....	..	..	..	..	..	..	..	..	..	....	..	..	..	..	..	..	....	..

The force of the wind and amount of cloud are expressed very approximately in figures from 0 to 10. † Snow and rain.

OCCASIONAL PAPERS.

The following papers, among others having relation to the public health, written by the Secretary during the year, may be of interest to individuals desiring to be informed of the co-operative movements of health associations of the different States, and of the suggestions of the Secretary in relation to Asiatic cholera in particular, and other infectious diseases in general.

To His Excellency A. O. Bourn, Governor, &c.:

In compliance with the request of your Excellency, that you be informed of the conclusions in regard to Asiatic Cholera, which received the assent of the members at the conferences of State Boards of Health, held in Washington, D. C., in May and December, and in St. Louis, Missouri, in Oct. 1884, the following brief report of that part of the proceedings which considered the subject of Asiatic Cholera, is respectfully submitted.

The principal propositions were as follows :

That, in order to prevent the introduction of Asiatic Cholera and its spreading if introduced, not only should there be municipal and State action, but also interstate, national and international.

That, in towns and cities, inspectors, or health officers of intelligence and prompt activity be appointed to examine the localities within the jurisdiction of each respectively, and cause the abatement of sources of danger to health, and also to act promptly in case of the occurrence of cholera or other dangerous epidemic disease, in accordance with the directions of the State or municipal Boards of Health.

In regard to the duties of the health officer, or sanitary inspector, the following report of a committee on municipal action will be suggestive.

"1st. That great care should be taken that the water supply should be of undoubted purity.

"2d. That all privy vaults should be abolished wherever water-closets can be supplied, and that wherever the existence of such vaults is necessary that that they should be rendered water-tight in such a manner as to prevent the saturation of the ground surrounding them, and that the contents of such vaults should be kept constantly disinfected and removed to a proper place at frequent intervals.

"3d. That all stagnant pools in the vicinity of habitable locations should, when practicable, be disinfected, and when possible the water removed by drainage or pumping, and the further accumulation prevented by filling with fresh earth or other material free from garbage or other filth.

"4th. That great care should be exercised to keep at all times clear and free from obstruction all sewers into which passes the refuse from dwellings, factories and other buildings, and that such examinations should be made as will detect imperfect plumbing in all buildings and the defects immediately corrected. In this connection special attention is directed to the necessity for the thorough ventilation of all soil and waste-pipes, and the dangers connected with untrapped and unflushed soil-waste and overflow pipes.

"5th. That extraordinary care should be exercised in reference to all tenement houses, lodging-houses, and, in general, all places where large numbers of human beings congregate, that no accumulation of garbage or other filth be permitted in cellars or yards, and that frequent and thorough cleaning and whitewashing of such structures be required ; and that householders should frequently and thoroughly examine their yards, cellars and closets and other out of the way places, to see that no other filth of any kind has been deposited there.

"6th. That the food supply be vigorusly watched to exclude from the market all unwholesome meat, all milk adulterated or from diseased animals, and all unripe fruits and vegetables, and that cowstables be kept at all times clean, and free from all excremental accumulations.

"7th. That all garbage, kitchen and household refuse, should be promptly removed from dwellings, stores and other buildings, to a proper place, where it may be destroyed by fire, or otherwise disposed of in such manner as to occasion no nuisance.

"8th. That such material should never be used in the filling of lots or disposed of by throwing the same in streets or vacant property where it may decompose and exhale offensive and deleterious gases.

"9th. That the attention of the authorities of all institutions, both public and private, and of individuals as well, be drawn to the great importance of maintaining a habit of personal cleanliness in persons under their charge, as being one of the most efficient means of warding off an attack of cholera, or, if it has once appeared, of greatly reducing its virulence and fatality.

"10th. Should the cholera appear in any place in this country the health authorities of the place should have immediate notice of the first cases in order that prompt action may be taken for complete isolation and disinfection.

"11th. That all authorities of States, cities or villages be urged to adopt measures which will result in the amelioration of all conditions such as have been referred to in the foregoing propositions, with the warning that in the opinion of this Conference such conditions if permitted to continue, will greatly promote the spread of cholera when it comes.

In regard to inter-state action, it was proposed ; That officers of State and municipal boards of health, especially in adjacent States, not only give prompt notice to each other of the occurrence of cholera in their jurisdiction, respectively, but also such particulars of such occurrence as might be of advantage to officers in other localities to which such notices should be sent, and also state what methods are being employed for its extirpation.

That State Boards of Health or chief municipal health boards in States where no State board is organized, should have power through the General Government to compel such sanitary measures as are imperatively needed to secure protection to the general public, if not otherwise attainable.

That the General Government should provide for all necessary national, international and inter-State action by Congressional legislation, naming the authorities or officials national, State and municipal, through and by direction of whom, proper measures shall be executed.

That the State governments should provide by legislation for the appointment by towns and cities, of suitable persons as sanitary inspectors and health officers, who shall also act, upon the occurrence of Asiatic Cholera, promptly in compliance with directions given by municipal and State Boards of Health.

SUGGESTIONS OF THE SECRETARY.

It seems quite proper also in this connection, to suggest what legislation seems to be needed in Rhode Island, to properly protect the citizens of the State from an extended invasion of the dreaded disease.

An examination of the Public Statutes will show, that very little of such legislation is needed to accomplish the desired purpose.

The following propositions in amendment of, or in addition to existing laws, are suggested.

That whenever the word "Small Pox," or the words "contagious or infectious diseases," occur in all the sections preceding Section 28 of Chapter 81 of the Public Statutes, it and they shall be construed to include Asiatic Cholora; and wherever the words "town council" occur in Sections 3, 4, 5, 8, 9, 13, 15, 17, 18, 22, 23, 24, 26 and 27 of said Chapter 81 of the Public Statutes, they shall be construed to include "inspector" or "health officer," and where the words "town clerk" occur in Sections 19, 20 and 21 of said Chapter 81, they shall be construed to include the words "inspector" or "health officer" when such inspector or health officer has been specially appointed by the town councils of the several towns for the special purpose of performing the duties of sanitary inspector and health officer, in compliance with the provisions of Chapter 81, and amendments thereto, and under such other instructions as may be given by town councils, or other town and city boards of health and by the State Board of health.

It will be understood, that the propositions imply that town councils *shall* make such appointments. Town councils can fix the compensation of such officials for service performed, if any, and with such restrictions as to expense incurred as may be reasonable. The Statutes now provide, that on the occurrence of Small Pox, town councils shall be informed and shall do certain things in restriction thereof. The time which must necessarily elapse, in giving information to all members of the council, and a meeting held, and action taken, and persons appointed, notified, engaged and commissioned to perform urgent work, might be fatal to the object of restriction in case of the advent of epidemic cholera, whereas a person appointed to act at once upon notification, and under instructions from competent authority, could take the needed steps immediately and with greater success.

It would seem that the amendments to the Public Statutes suggested above, would be amply sufficient to place the State in a condition to successfully resist an invasion of Asiatic Cholera.

In addition to other measures, and to give greater assurance to protection, and to meet possible exigencies, it is suggested that a special appropriation of $1,000 be made, to be expended in case of necessity, by the advice and under the direction of the Governor.

It is also suggested that the joint Committee on Public Health, confer with the State Board of Health, on the framing of an Act in conformity with the above suggestions, or with such other provisions as may be deemed more suitable.

I am with great respect

Yours truly,

CHAS. H. FISHER,

Sec. of the State Board of Health.

OFFICE OF SECRETARY OF THE STATE BOARD OF HEALTH.

(CIRCULAR No. 16.)

To Physicians:

Early in the summer of 1878 a circular was issued from this office, and distributed to physicians and others throughout the State, calling attention to methods of preventing the spread of communicable diseases, and of lessening the prevalence of the ordinary diseases of the warmer season.

In relation to ordinary summer diseases it was remarked, in connection with other suggestions, that "Diarrhœa, Dysentery, Cholera, Cholera Morbus, Cholera Infantum, Typhoid Fever, etc , are primarily affections of some portion of the intestinal canal. Such being the facts, the natural inference would be that they were caused by some errors of diet and regimen. While these play a *very* important part in the production of disease, and especially of summer diseases, there are other morbific materials, which, absorbed into the body by the lungs or skin, or taken into the stomach, become equally active agents, directly or indirectly, in the causation of disease. Among them are the noxious gases, gaseous compounds and disease germs or infectious particles, that float in the atmosphere or in the water we drink. Now, whether some diseases arise from the inception of minute *living* germs, or poisonous *inorganic* particles, solid, liquid or gaseous, it is known beyond question that whatever the agents are, and whatever the form may be, they may and do germinate in, or emanate from, fermenting and putrefying decomposition of animal excreta, and other inanimate organic matter."

Attention was therefore directed to putrefying filth as a probable cause of disease, directly or indirectly, "wherever found ; whether on the surface or in sew-

ers, or in soil pipes, sink drains, cesspools, privies, pigsties, house yards, courts, alleys or cellars," and suggestions made in regard to various modes of disposal and disinfection.

In regard to disinfection of the excretions of persons sick with Typhoid Fever, Scarlatina, and other communicable diseases, and having in mind the danger of communication through the medium of water as well as of air, it was suggested that "All the smaller discharges of the nose and mouth should be received on pieces of cloth and burned, and all the larger of the same, and all the stools and passages of water, should, if possible, fall into vessels containing at least a pint of a solution of green copperas, (one pound of copperas to one gallon of boiling water) and carried, if the premises will allow, to some distance from the house and covered with a light coating of *dry* earth. If the excretions are thrown or fall into a water-closet bowl or trap, or into the vault of a privy, the same solution, with the addition of four ounces of sulphate of zinc to the gallon, should be thrown into the receptacles and upon the discharges in sufficient quantity to decompose any inorganic infecting particle, or destroy the vitality of any organic ovum, spore or germ.

Keep the discharges out of streams of water, and away from the vicinity of wells from which potable water is taken.

This last precaution is absolutely necessary in cases of malignant Dysentery, Cholera, and Typhoid Fever. It should also be observed in cases of Diphtheria, Scarlatina, and Small Pox. Subjection to high degrees of heat (not less than 212° Fah. and for at least one half hour) is however the most absolutely effectual appliance, and should be adopted whenever circumstances will allow."

Methods of destruction by charring or burning, in furnaces or by other modes, and of boiling in water and baking in ovens, of clothing and other textile fabrics, will be readily suggested to the medical attendant.

It may seem hardly necessary that the attention of the Profession should again be called to the subject of disinfection of morbific excreta; but from my own experience I am aware how prone physicians in active and hurried practice are to pass over by inadvertence matters that seem extraneous to the all-absorbing question of the best immediate good of the *patient in hand*, and so neglect precautions which have in view the possible prevention of disease in *some other individual* at a subsequent date. But with the evidence, added to that previously known, furnished by numerous investigations made since that time, that the infectious germs of some diseases, and particularly Typhoid Fever, have been transmitted through the medium of well and other potable waters, which have been contaminated by the dejections and other excretions of the sick, and also through the medium of the milk of cows drinking the contaminated water, and of milk transported in vessels that had been washed with such water, and the possibility that other diseases like Diphtheria and Scarlatina may be so communicated, and especially Asiatic Cholera, which in the near future will probably menace our own shores, it seems quite proper that attention should again and frequently be directed to the serious results that might occur from negligence in the disinfection and disposal of the stools and other excreta of persons sick with infectious and communicable diseases.

As you are aware, the belief that some, if not every one of the infectious diseases, has each for its causation its own special agent or special infecting particle (and that the infecting particle or germ is an organic solid having vital properties, and so minute as to float easily in suspension and unperceived in water and other liquids, and in some forms in the atmosphere and in the gases of putrefactive decomposition,) has been steadily gaining the acceptation of the almost entire body of the medical profession, and by almost if not entirely all of the most prominent pathological scientists of the world.

It is quite true, as will be admitted, that the precise and scientific methods of inquiry and examination in pathological research, during the last few years, (every step in which has been met by protest and challenge, thereby insuring greater caution and attention to details, and the better avoidance of fallacies,) have changed the face of etiology, and put upon a seemingly reasonable foundation, the theory of the propagation and dissemination of a number of the zymotic diseases by the transmission and inception of infectious germs.

Without speculating upon the morphological characteristics or properties of the germs, (as to forms or stages of life in which they are most poisonous, as of egg, larva, pupa or mature animal parasite, or seed, spore, root, leaf, or whole mature plant of vegetable parasite,) it may be assumed that if *absolutely destroyed at the time of discharge from the bodies of the sick,* whatever the form or state, that ends all possible chance of future harm.

It would seem, then, that as a matter of precaution even if only as against a possible danger to bodily health, as well as of the incurrence of dangerous sickness and the destruction of human life, the physician in charge of every case of communicable zymotic sickness should give special directions in regard to the disinfection of the discharges.

It is hardly necessary to specify largely the particular modes by which that work may be best accomplished, as all physicians are already familiar with the different disinfectants and methods of application.

For the purpose of convenience, it may however be well to suggest a few of the disinfectants most easily obtained, most easily handled, least costly in money value, and quite as effectual in results.

1. Sulphate of Iron, 1 to 2 lbs. to one gallon of hot water.
2. The above with the addition of 2 to 4 ounces of Sulphate of Zinc.
3. Sulphate of Zinc, 4 to 6 oz. to one gallon of water.
4. Common Salt, a saturated solution to be used while hot.
5. The above (No. 4,) with ¼ to ½ ounce of Chloride of Zinc to each gallon, may be used cold.
6. Powdered Borax, ¼ to ½ lb. to one gallon of hot water.
7. Perfectly *dry* loam, or *dry wood* ashes for privies and out door use.

Nos. 1 to 4, inclusive, may be used in chamber vessels, water closets or privies.

Nos. 3 to 6, inclusive, for immersing soiled cloths, or with the addition of an equal quantity of hot water, and used hot, for washing clothing, &c.

Nos. 1 and 2 will discolor or spot paint, and spot some textile fabrics.

Nos. 3, 5 and 6 may be used to cleanse the hands.

Corrosive sublimate, though the most efficient of all ordinary chemicals, would hardly be regarded as a proper disinfectant to prescribe for general use, except in families of intelligence and prudence. For the chamber-vessel, water-closet or privy-vault, a solution of corrosive sublimate (one-half to one dram to the gallon of water, with one dram of powdered sal ammonia to complete the solution,) is an effectual appliance for the desired purpose. Keep in glass or unpainted wooden vessels.

To disinfect by fumigation, Sulphurous Acid gas is entirely efficient.

To fumigate a room with Sulphurous Acid, the contents must be so arranged that the fumes may come in contact, as far as possible, with the entire surfaces of all the articles to be disinfected, as well as sides of the apartment. It will discolorize some fabrics.

Across a tub partly filled with water, place a pair of tongs or other support, for an iron basin or skillet, or thick earthen pan. Put in the basin or pan, a layer of ashes one inch thick, then a layer of bright live coals, upon which scatter at least from two to four pounds of powdered or crushed sulphur, according to the size of the room. A moderate quantity of moisture from the steam of warm water would facilitate the action of the gas. Close the apartment tight, and leave for twenty-four hours. Then ventilate freely.

Fresh air in the sick room will of course be required by the medical attendant, and such other precautions as the cases demand and the circumstances will permit.

Yours truly,

CHAS. H. FISHER.

JANUARY, 1884.

[CIRCULAR 28.]

SUGGESTIONS IN RELATION TO PREVENTION AND RESTRICTION

OF

ASIATIC CHOLERA.

To Boards of Health, Health Officers, and the Public:

It would be unwise to create unnecessary alarm in the public mind, in relation to the advent of epidemic cholera in Rhode Island, during the year 1885. It is a trite maxim, however, that "**Forewarned is forearmed.**" Incredulity and perversity are destructive of the benefits of foreknowledge and admonition.

Judging by the past, it must be admitted that the **Asiatic Cholera will reach the shores of America during the ensuing year.** What port it will first strike, or in what inland city or town it will first make its appearance, cannot be foretold. In former invasions it has sometimes been carried, by immigrants and other travelers, past quarantines and through ports of entry, and over railway and water routes of largest traffic, without leaving a trace, and manifesting its presence only when, on arrival at the point of ultimate destination, the luggage and household goods, brought from infected localities, are unboxed, unpacked and shaken out.

How Avoided.

Without working upon the fears of any community, **it seems the part of prudence** to agitate the subject of **measures for the prevention of the introduction** of the exotic destroyer, and of **measures for defence in the event of its appearance,** by which its prevalence shall be RESTRICTED, and its existence STAMPED OUT.

To accomplish the most desirable purpose of prevention of introduction, or the equally important purpose of restriction and extermination in case of its outbreak, **active measures are imperatively demanded,** not only on the part of the National and State governments, but by municipal authorities, also by the appointment of local sanitary police, and also on the part of every private citizen.

It is expected that Congress will, during the present session, enact, and the administration will put in execution, measures to prevent, as far as possible, the introduction of the disease into the United States.

It is also expected that the State Legislatures, which have not already made provision, will, at each next session, make suitable preparation, by appropriation and otherwise, for meeting the dreaded scourge upon its first appearance, and for restricting its prevalence to the smallest possible number.

But the towns and cities must appoint the local sanitary agents, who shall, in their respective municipalities, co-operate with such authorities as the National and State governments shall provide.

How to Prevent Spreading.

The State Boards of Health, to which have been given judicial and executive powers, will act promptly upon notification of an outbreak within their respective jurisdictions.

The State Board of Health of Rhode Island has not been granted such powers. In case of an outbreak of cholera within the State, it cannot (unless such powers are conferred hereafter) act promptly, except through town officers, in the control, isolation, removal or supervision of the dangerous patients or families, or compel such separation and disinfection as will protect the immediately surrounding community, and, consequently, the more distant general public.

Therefore if the towns in Rhode Island make no appointments of persons specially authorized to act promptly upon advice and by direction of the State Board (to be given hereafter), **the disease if introduced may gain such headway** and attain such epidemic proportions **as to endanger hundreds of lives before** legal meetings of the town councils acting as boards of health can be held, or **such authorities as now exist** with restricted powers (except in two or three municipalities) **can do effective work.**

In a communication to the Governors of the several States, sent by the National Board of Health in November of this year, in compliance with an act of Congress passed March, 1879, there occurs the following paragraph :

"**No portion of any State should be left unguarded,** for our facilities for both local and inter-State communication afford ample means for carrying the poison far and wide throughout the land. In the absence of a sanitary service at any point, that point may, in the event of the appearance of cholera, become the center from which the infection may be spread to other portions of the States."

This quotation is directly to the point, and is appropriate in this connection. Every city and town should appoint a special board of health, or appoint competent men residing in the different sections of the town, who may be called upon and be ready to act with an hour's notice, under directions of the State Board of Health previously given, in case of an outbreak of cholera or other dangerous epidemic sickness.

Causes Immense Pecuniary Loss.

The occurrence of Asiatic Cholera in any part of eastern or southern Rhode Island, during the warm season of any year, **would drive away or keep away several thousands of persons** who annually visit the numerous places of summer resort upon the tide waters and inland towns of the State.

Any considerable number of cholera cases would largely depopulate the section wherein they occurred. Business would be almost at a standstill, commercial traffic and passenger transit (except to leave) would be almost wholly restricted, **and great financial loss,** including all classes of citizens, **would ensue.**

Other Means of Prevention and Restriction.

But it is believed that by **reasonable preparation,** by vigilance, and by promptness of action when danger presents, such disastrous consequences may be avoided. **Negligence may be suicidal.**

By **reasonable preparation** other measures in additlon to those already indicated, are required, to supplement them and make them more complete. **Cholera cannot flourish in a pure atmosphere.** It cannot be developed even except in the presence of warmth, moisture and organic decomposition. **Putrefaction is its nutriment.** It fails of birth or **dies of starvation in pure air, a sweet soil and wholesome water.**

The **reasonable preparation** is clearly evident. Health inspectors should be appointed to traverse every village and areas of larger population. Citizens should have public spirit enough to co-operate, especially on their own premises. **Search after and abate all filth nuisances,** remove all rotting vegetable or decomposing animal substances lying scattered or in heaps in streets, house yards, alley ways or corners, hidden or visible, the accumulations in privy vaults or fermenting in cesspools or sink drains, decaying vegetable and other matter in cellars, out-houses and pantries, decaying garbage, meats, fats and remnants of food beneath sinks and in closets, and all rubbish, dirt, rags and old clothes, of wool or cotton, mouldering or mildewing in dark closets and cubby-holes.

The entrance of sewer gas within dwellings and workrooms should have especial attention, not only as a preventive of cholera, but because of its pernicious influence in the destruction of the best constituents of the blood, and the deterioration of the general health, by which the inmates of some of the more costly houses even, are fitted to become ready victims not only of cholera, but of diphtheria, scarlatina, cholera infantum and other diseases, which have almost as large a percentage of deaths to the number sick as cholera itself, and **yearly** cause a sad mortality which might have been prevented.

It will be understood that general cleanliness, pure air and pure water are the great desiderata, and it will be suggested to sensible inspectors and intelligent citizens, what measures, under different circumstances, are required to accomplish the desired result.

It may be stated, as an undeniable proposition, that if **the authorities** of the several towns and cities of the State, **do their duty** in relation to sources of dis-

ease existing under their legal jurisdiction, **and all occupants or owners of buildings** during the coming spring, attend to and secure thorough cleanliness and ventilation of their premises, **the State may bid defiance to the Cholera.**

Conclusions.

The following propositions may be taken as based upon facts of present knowledge, and, partly in repetition of and partly in addition to the foregoing remarks, are applicable to the present exigency :

The Asiatic or epidemic cholera is caused by a specific poison.

The said specific cholera poison does not at this time exist in America.

It does exist in western Europe.

It has always heretofore appeared in America following its prevalence in Europe.

It cannot cross the Atlantic ocean except by means of persons and goods from infected localities, transported in ships.

It can be largely, if not wholly, prevented from reaching America, by international co-operation, through consular and health officers, **by thorough inspection of persons and goods** from cholera infected localities, and the proper detention of suspected persons, and proper treatment of suspicious goods, **before embarkation** or transference on board ships, or before the ships leave the port.

It can also be largely prevented from introduction into America, by telegraphic notification of National or municipal authorities in this country, of the departure and port of destination of all vessels sailing from infected ports in other countries, with *possibly* infected persons or goods, in order that their arrival may be anticipated.

It can be largely prevented from landing on our shores by close scrutiny on the part of quarantine health officers, by the investigation of the antecedents of passengers, and by such inspection, detention and treatment of suspected persons and goods, as will give reasonable assurance that debarkation is safe.

The cholera poison is subtile and invisible, and may elude quarantine and all vigilance and care, may not be destroyed or reached by disinfectants or other means, **and may therefore be landed on our shores** in a latent state, but with unimpaired powers, and ready to develop into intense activity and virulence, increasing or multiplying with enormous rapidity where the proper conditions for such increase, and the acquirement of such virulence, are afforded.

The infective poison or gem of cholera seems to require a process of change or transformation, after expulsion from the bodies of the sick, **to properly fit and prepare it** for further infection, or at least to acquire more virulent properties.

Such change may occur, under favorable conditions, in a few hours, or by being partially dried in connection with the excretions, on cloths or otherwise, **the change may be delayed until** such **favorable conditions** are provided.

The favorable conditions which are required for the change or development, the increase or multiplication and acquirement of the needful virulence of the infective poison or germs of cholera, **are furnished by decomposing organic matter, and impure air.**

Wherever putrefying animal or vegetable matter exists, or decomposing excreta, or untrapped sewer-pipes, or foul sink-drains, or the foul air of unventilated sick rooms, there are found the **favorable conditions which**, united with warmth and moisture, **invite the cholera poison** to come and be fed, and be strengthened and multiplied for deadly work.

A weighty responsibility, therefore, **rests upon all municipal authorities**, who are warned, in the interest of the saving of life, to adopt and execute measures **for the abatement of cholera-breeding places** in their respective jurisdictions.

A weighty responsibility also rests upon owners and occupants of buildings, of all kinds whatever, in that they keep out the cholera by cleansing and keeping clean their several premises inside and outside, and in keeping the air pure and sweet.

If such sanitary improvements are made, and cholera does not appear in Rhode Island, **there will still be a great saving of life, by the prevention of other diseases** which annually prevail, and which, with a fatality almost if not equally as large, annually sweep great numbers into the grave.

The above suggestions and propositions are presented to the consideration of the authorities and other citizens of Rhode Island, in the face of a calamity now impending, with the hope and belief that they may evoke a more extended and particular attention to methods of defence against cholera and other preventable diseases, and incite to more complete and special sanitary improvements indoors and outdoors.

Respectfully,

CHAS. H. FISHER,
Secretary of the State Board of Health.

DECEMBER, 1884.

CATTLE COMMISSION.

No widely spread contagious disease of domestic animals occurred in Rhode Island during 1884. Hog cholera, so called, prevailed more largely than usual, having been reported from a considerable proportion of the towns. It occurred, however, only in separate piggeries, at long distances apart, and under different modes of feeding and under different conditions of care.

Inoculation has been practiced to some extent, with what is believed to be fairly beneficial results. The ratio of mortality has been large in all the separate localities, though claimed to be less where inoculation was performed. More careful methods of procedure, however, will be needed to decide with any definiteness to what extent inoculation may be of advantage.

GLANDERS.

This disease of horses holds the even tenor of its way, or with perhaps a slightly increased number of animals condemned because affected with the disease in 1884. The number was twenty, six of them however, were in the State less than twenty-four hours, having been brought in connection with O'Brien's circus, into the town of Pawtucket.

The Secretary of the Board was enabled by the vigilance and assistance of the Chief of Police and health officer Stanley of Pawtucket, to obtain timely notice of the incoming suspected horses, and therefore enabled to separate by expert veterinary assistance the diseased animals and cause them to be destroyed.

Of the remaining fourteen, six were found in the city of Providence, two in Cranston, two in Pawtucket and one each in the towns of North Providence, Johnston, and East Providence and one in the city of Newport.

There were forty-two horses reported during the year by different parties as suspected of having glanders or farcy, and one hundred and eighteen inspections and visits of examination were made exclusive of the eighty-six horses connected with the O'Brien Circus examined at the time of the entry of that circus into the State. Including the circus horses, more than two hundred inspections and examinations of horses were made during the year, with the result of the condemnation of twenty.

TUBERCULAR CONSUMPTION.

Considerable attention has been given to the subject of the prevalence of pulmonary consumption among cows. The Secretary has been approached by a score or more of persons of intelligence and cultivation, who were suffering from a considerable degree of solicitude in the apprehension of danger from the use of milk, lest they might become diseased through the reception of the germs of tuberculosis in the milk which they drank.

If it has ever occurred that a human being has been infected with tubercular consumption by means of cows milk, the circumstances must be quite rare, and the proof very indefinite. However that may be, it is none the less true, that milk from a constitutionally diseased cow cannot be healthy food or drink. Numerous cases of suspicion of sale of milk from diseased cows have been reported, and every such case has been investigated. Except in two instances where the cows were disabled by injury to the limbs and not diseased, no case was found where the milk from the suspected cows was sold.

While it may not be doubted that milk brought into the cities and villages of the State, is in many instances reduced by the abstraction of the cream and other constituents, or by the addition of water, and perhaps adulterated by the addition of gelatine and other cheap but usually innocuous substances, and therefore be lacking in proper nutritious qualities, it cannot be other than a very extraordinary circumstance, if ever, that it is the cause of a specific disease arising from the condition of the cow.

The danger is far greater from the drinking of polluted water by the cow, or uncleanliness in the washing of the cans, or use of impure water for dilution, especially where water is taken from brooks, ponds or wells to which the stools and other excretions or leaching of the same, of persons sick with typhoid fever and other infectious diseases, finds access to. The number of cows affected with pulmonary

consumption in the State of Rhode Island in proportion to the whole number is exceedingly small. There are probably not over a hundred cows in this State sick with consumption at the same time, which compared with over twenty thousand, the whole number, would make a proportion of only one-half of one per cent.

CONTAGIOUS PLEURO PNEUMONIA.

This disease, which had for many years been confined to a strip of the United States, beginning in and around Brooklyn, N. Y., and in the vicinity of New York city, and including New Jersey, eastern Pennsylvania, Maryland and Virginia, has, during the latter part of the year 1883, and in 1884, been transferred to Ohio, Illinois and other States in the west.

This fact, which was for many months stoutly denied by the cattle breeders in that section of the country, and by the entire body of live stock traders, is now so well established as to be undeniable, and as so many more cattle are brought from the western States to the New England States than from the nearer sections in the vicinity of New York, the danger of the transference of the disease to Rhode Island is thereby increased. But with timely notice given the State Board of Health it can hardly be probable that the disease if introduced can obtain any large prevalence in this State.

In the report for 1883 there was presented the draft of "A Bill for the establishment of a Bureau of Animal Industry for the suppression and extirpation of pleuro-pneumonia and other contagious diseases in domestic animals." The Bill has since passed both Houses of Congress and become a national law.

The following sections taken from the bill will give an idea of the objects designed to be accomplished and the means of accomplishment.

SECTION 1. The Commissioner of Agriculture shall organize in this department a bureau of animal industry, and appoint as chief a competent veterinary surgeon, whose duty it shall be to investigate and report the number, value and condition of domestic animals of the United States, their protection and use; also to inquire into and report the causes of contagious, communicable diseases among them, and the means of prevention and cure of the same, and collect such information on these subjects as shall be valuable to the agricultural and commercial interests of the country. The salary of the chief of the bureau shall be the same as that of other chiefs of divisions in said department. The Commissioner is also authorized to appoint a clerk of said bureau, at a salary of $1,500 per annum.

SEC. 5. That it shall be the duty of the Commissioner of Agriculture to prepare such rules and regulations as he may deem necessary for the speedy and effectual suppression and extirpation of contagious pleuro-pneumonia, and certify such rules and regulations to the executive authority of each State and Territory, and invite said authority to co-operate in the enforcement of the provisions of this act. Whenever the plans and methods of the Commissioner of Agriculture shall be accepted by any State in which pleuro-pneumonia or other infectious or contagious diseases are declared to exist, and whenever the Governor of the State, or the other properly constituted authorities, signify a readiness to co-operate for the extinction of any contagious or infectious disease, the Commissioner of Agriculture is authorized to expend so much of the appropriation as is necessary in the investigation of the facts as to the disease, in paying for animals deemed necessary to slaughter, and in such disinfection and other means necessary to stamp out the disease; and whenever a State, in any section of which contagious or infectious disease exists, which the Commissioner of Agriculture has declared dangerous to the animal industries of the nation, fails to make provision for its extinction, or co-operate with the plans of the Commissioner of Agriculture for the extinction of the disease, the President of the United States, on the presentation of the facts by the Commissioner of Agriculture, shall be authorized to declare said State, or such part of said State as is dangerous to the animal interest of the country, in quarantine, and prohibit the exportation of cattle out of said State or district.

SEC. 7. That no railroad company within the United States whose road forms any part of a line of road from one State or Territory to another, or the owners or masters of any steam, sailing or other vessel shall receive for transportation or transport from one State or Territory to another any live cattle affected by any contagious or infectious disease, and especially the disease known as contagious pleuro-pneumonia, or lung-plague; nor shall any person, company, or corporation deliver for such transportation to any railroad company or master or owner of any vessel, any live cattle knowing them to be affected by any contagious or infectious disease; or any person, company, or corporation drive on foot or transport by private conveyance from one State or Territory to another, any live cattle, knowing them to be affected by any contagious or infectious disease, especially contagious pleuro-pneumonia or lung plague.

The Chief Veterinarian appointed by the Commissioner of Agriculture for the Bureau of Animal Industry, is Dr. E. Salmon, D. V. S.

EXTRACTS

FROM A REPORT TO THE

City Council of Providence, R. I.

BY

SAMUEL M. GRAY, C. E.

OF PROVIDENCE,

MEMBER OF THE STATE BOARD OF HEALTH.

REPORT.

City Engineer's Office,
Providence, R. I., July 23, 1884.

To the Honorable the City Council of the City of Providence:

In pursuance of certain resolutions passed by your honorable body, to wit: That the city engineer and assistant Charles H. Swan be directed to proceed to Europe to investigate the various plans in practical operation for the disposition and utilization of sewage, and the city engineer to report to the city council the result of such investigations with such recommendations with reference to the sewage of this city as he may deem expedient,

I respectfully present the following report :—

During the investigations made, sewerage systems and methods for the disposal of sewage have been inspected at the following places :—

The pail system of disposing of excreta at Birmingham and Manchester, England.

The Liernur system of sewerage at Amsterdam.

The Berlier system at Paris.

The Shone system at Wrexham, Wales.

The combined system at London, Berlin, Paris, and Frankfort-on-the-Main.

The separate system at Oxford, and at Paris where it is being tried experimentally to a limited extent.

Works for the disposal of sewage by irrigation were inspected at the following places: Bedford, Berlin, Breslau, Croydon, Dantzic, Doncaster, Edinburgh, Leamington, Milan, Oxford, Paris, Warwick, Wimbledon and Wrexham.

Works for the disposal of sewage by chemical precipitation were inspected at the following places: Aylesbury, Birmingham, Bradford, Burnley, Coventry, Cronberg, Hertford, Leeds and Leyton.

Works in process of construction were also seen at Frankfort-on-the-Main.

As the result of my investigations and study of this question, I recommend, first, that intercepting sewers be built; second, that the sewage of the city be conveyed to Field's Point; third, that it be treated there by chemicals in such a manner as to precipitate the matters in suspension and to clarify the sewage; fourth, that the clarified effluent be emptied into deep water at Field's Point.

My reason for recommending precipitation is that I am confident that the sewage can be so clarified that the effluent will be entirely harmless when emptied into the river at Field's Point, and the purification can be accomplished at less expense than by irrigation. Although sewage is more fully purified by irrigation than by precipitation, I have not felt justified in recommending its adoption, for, from careful and extended surveys, I am convinced that the large amount of suitable land required for irrigation cannot be obtained at any reasonable cost within reasonable distance of the city.

* * * * * * * *

It is proposed to construct tanks and erect suitable buildings and works for the mixing of chemicals with the sewage, and for the handling of the sludge, etc. The sewage, after receiving the mixture of chemicals, will flow into precipitation tanks, where it will remain for a short time to cause the deposit of sludge; the clarified effluent will flow off into deep water at the point as shown on the plan.

The sludge left in the bottom of the tanks will then pass into receivers, from which it will be forced by compressed air in to filter presses. Plate 23 in Appendix A represents such a press. By this press the sludge is easily compressed into a portable form. That this sludge possesses some value as a fertilizer there is no doubt; it remains to be proved whether there will be any sale for it in this vicinity. Therefore, for the purposes of this report, I assume that there will be no immediate income from its sale as a fertilizer.

Extensive experiments have been made with floats at different points in the Providence River, principally at Field's Point and at Conimicut Point, to ascertain what probable action the tide and the currents of the river would have on the sewage if emptied at these points.*

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From a careful study of these experiments, and from long and close observation of the causes of the present pollution of the Cove, the

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* See Original Report, Pages 133–135.

Providence River and its tributaries, I am of the opinion that if the crude sewage of the city be emptied into the river at Field's Point it will inevitably cause a nuisance, to the injury not only of the dwellers within the city, but to the occupants of many of the shore resorts and residences bordering on the Providence River and Narragansett Bay, and will seriously damage, if not destroy, many of the valuable oyster beds which now line the shores. * * * A very important factor in the pollution of the Cove, as well as the Providence River and its tributaries, is the liquid wastes of manufactories emptied into the rivers. There are, as near as I can estimate from the best obtainable data, upwards of 2,735,000 gallons of filthy liquid wastes emptied daily (Sundays excepted) into the Moshassuck and West Rivers, and upwards of 2,088,000 gallons into the Woonasquatucket River, making a total of 4,823,000 gallons of filthy liquids, aside from town sewage, emptied into the several rivers during twelve or fourteen hours out of the twenty-four. I wish to call your attention emphatically to the fact that however thoroughly the town sewage may be kept from the rivers, if these foul liquids from manufactories are allowed to enter the streams, as at present, the Cove, together with the Providence River and its tributaries, will continue to present about the same filthy appearance that they do to-day. It is only by keeping all sewage and filthy liquids out of these waters, or by clarifying them before they are permitted to enter, and by thoroughly clearing the river beds from all deposits of filth, that we may look for improvement in the condition of Providence River and its tributaries. I am convinced from my observations abroad, that in some cases the quantity of liquid wastes now emptied into the river from manufactories might be materially reduced, and that the remainder could be so clarified by the proprietors as to prevent polluting the river, and possibly result in some instances in a source of income to them.

In designing the sizes of the intercepting sewers, I have thought best to make provisions for receiving the liquid wastes of these manufactories. It is an important question for your consideration on what conditions it may be advisable to admit these liquid wastes into the sewers.

The estimated daily dry-weather flow of town sewage in Providence at the present time is about 3,000,000 gallons. This is based on careful and extensive gaugings made at different times of the amount of sewage flowing in the several sewers. A clearer idea of the extent of these gaugings will be gained by reference to diagrams and table of

gaugings found in Appendix C,* pages 136 and 137. It will be seen by table of gaugings that the sewers laid in the wet localities furnish a much greater quantity of sewage, per inhabitant connected, than do the sewers laid in dryer parts of the city. This larger quantity of sewage is due in most localities to spring or ground water, which finds its way into the sewer. The great value to the general health of the community of thus draining the ground is too apparent to need comment. There were, on June 1, 1884, 3,528 connections with the sewers. It is estimated that these connections take the sewage from 36,421 inhabitants.

In designing the intercepting sewers, liberal provision has been made for a population of 300,000 inhabitants within the present city limits, together with small districts lying outside the present limits, whose only outlet will be through the city. (Referred to in Appendix C,* pages 128, 131.)

The intercepting sewers (excepting the main sewer of the ninth ward) are designed to carry $\frac{1}{100}$ of an inch of rain-water per hour from the district drained, together with the liquid wastes before referred to from manufactories, and sixty gallons of sewage per inhabitant, including ground water. The manufactories' waste is estimated to flow off in ten hours. Of the sewage one-half is estimated to flow off in seven hours. This requires a marginal sewer, when flowing nearly full, of seven feet two inches diameter at the lower end in Allen's Avenue, near the Corliss Cove.

At the junctions of the district outlet sewers with the intercepting sewers, there will be overflows into the river for the relief of the sewers from the excess of rain-water. These overflows will be so arranged that when the amount of rain-water coming from the district sewers exceeds the amount provided for in the intercepting sewer, the excess of water will flow directly into the river. An overflow will also be provided near Field's Point, to be used, if necessary, in case of heavy storms.

* * * * * * * *

The marginal sewers should be so constructed that no spring or ground water will leach into them, thereby reserving their whole capacity for the purposes for which they are built.

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The system of sewerage in use in this city, as is generally known, is the combined system.

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* Original Report.

Of the sewers now laid (about fifty miles) very few, if any, need be disturbed, and usually in the future it will be well to continue the combined system, except in special cases where the separate system may be used to better advantage, or where storm-sewers may be needed.

The estimated cost of the whole work herein recommended is $3,699,504.00.

In estimating the cost of the precipitation tanks and pumping machinery, liberal provision has been made for present needs; that is, for the amount of sewage that may be intercepted on the completion of such marginal sewers as are needed at present. The tanks and machinery are to be so arranged that additions can be easily made when required. In all other respects the estimate includes the whole cost of the complete system of marginal and outfall sewers needed for a population of 300,000 inhabitants.

A more detailed statement of estimates will be found in Appendix C.*

Experience in England, on well-managed works, shows that the cost of chemicals and labor for treating sewage by precipitation varies from 1 shilling (24 cents) to 1 shilling 6 pence (36 cents) per annum per inhabitant connected with the sewers. This cost would not form a safe basis upon which to calculate in this country. It is believed, however, that double the cost mentioned would be a liberal amount on which to base our estimates of the cost of the chemical precipitation of sewage.

In this connection it may not be improper to consider some of the various suggestions that have been made for disposing of the sewage of this city by irrigation and otherwise.

Experience indicates that the amount of land required for the disposal of sewage by irrigation is about one acre to one hundred inhabitants. The population provided for in the proposed system of intercepting sewers is 300,000. The amount of land necessary to properly dispose of the sewage of that population would be about 3,000 acres.

It has been suggested to take the sewage to Seekonk Plains for irrigation. The great expense of conveying the sewage across the Seekonk River and to this land, together with the fact that the available area is less than one thousand acres, forbids a consideration of this scheme.

It has also been suggested that the sewage be taken to Warwick

* Original Report, Page 139.

Plains and there used for irrigation. From extensive surveys of this territory, I am satisfied that there is not a sufficient quantity of suitable land in that locality for the future needs of the city. The estimated cost for construction, in accordance with this suggested scheme, including only sufficient quantity of land for the present needs, is $1,146,000 more than for the plan of precipitation herein recommended. The annual cost of pumping the sewage to Warwick Plains would be double the cost of the pumping required in the plan recommended. Considering the additional cost, and in view of the fact that there is not a sufficient quantity of land at Warwick Plains for future needs, I deem it unnecessary to further consider this scheme.

By combining precipitation with irrigation a much smaller area of land is requisite, and should it hereafter be deemed advisable to adopt some system of irrigation, the proposed precipitation works will form a most useful auxiliary.

Another suggestion has been made, which is to take the sewage down the river to Conimicut Point, and there, in its crude state discharge it into the bay. I estimate that the carrying out of this scheme would cost $1,194,000 more than the plan I have recommended. The annual cost of pumping to Conimicut Point would be nearly double the cost of pumping in accordance with the plan recommended. Moreover, the experiments made at this point with floats show that there are strong reasons for fearing that crude sewage emptied into the bay at this point would create a nuisance in the not distant future.

Appendix A contains descriptions of the various systems of sewerage now in use in England and on the Continent of Europe, types of which I have carefully inspected. It also explains the general principles of sewerage and of sewage disposal, and gives much historical matter connected with the subject of town sanitation.

In Appendix B will be found tables of statistics obtained at places visited, and also statistics of the town of Pullman, Ill., which were kindly furnished by Col. W. E. Barrows.

Appendix C contains descriptions of location of marginal and main sewer lines, charts and explanations of float experiments, table and diagrams of gaugings of sewers, sewer district maps, and estimates connected with the proposed system for the city of Providence.

No system of sewerage is complete which fails to dispose of the sewage so as to avoid its causing a nuisance. It is believed that if the scheme herein recommended be thoroughly carried out, the Provi-

dence River and its tributaries may be reclaimed from their present filthy condition, and that the air which is now so often laden with foul gases rising from their waters may be preserved pure and wholesome.

While the cost of carrying out the plan herein recommended is large, aside from the annual expense for operation, and while no direct money returns can be expected to result from it, it cannot be denied that the gain in health and comfort that will result to our citizens will add prosperity and wealth to the city.

The time required for the completion of the work depends, of course, upon the vigor with which it is carried on. With such a force as could be employed to advantage, some portions of the work may be made available for use within two years; an additional year would suffice for its substantial completion.

Inasmuch as the resolutions under which this report is made call mainly for investigations relative to the disposal of sewage, I have omitted to dwell upon many other important questions relative to the subject of sewerage. Reference to some of them, however, is made in Appendix A.

The system herein recommended is not new, the constructions involved are not experimental; they are in successful operation in many of the towns and cities of Europe. Hence my confidence in recommending their adoption for the city of Providence.

SAMUEL M. GRAY,

City Engineer.

APPENDIX A.

SEWERAGE SYSTEMS AND SEWAGE DISPOSALS.

HISTORY OF TOWN SANITATION.

The protection of the public health by means of the proper removal and disposal of household and town wastes is becoming a question of the first importance in this country. It has occupied the attention of the leading medical and engineering authorities in Europe for many years, especially in England, where the density of population and the great number of manufacturing establishments have caused the rivers and streams to be polluted to an extraordinary degree with liquid filth, and their channels to be encroached upon by deposits of offensive mud and heaps of solid refuse.

SANITATION IN ANCIENT TIMES.

The amount of attention given to the general subject of public health has been very various at different periods, and may be taken to a certain extent, as an indication of the degree of civilization attained by the different nations in the past.

The record of the sanitary works of the earlier nations of antiquity is very imperfect. The remains of works of sewerage and water supply have been discovered at nearly every place of importance where excavations have been made, both in the great cities, as Nineveh, Jerusalem, Carthage, and Rome, and those of smaller size, as Pompeii, Herculaneum, and many other places.

Rome stands pre-eminent for the magnitude of its works of water supply and drainage. For more than four hundred years after the building of the city, the Romans were satisfied with water drawn from the Tiber, or from wells and springs. About the year 311 B. C., the first aqueduct for the general supply of the city was constructed. This, the Aqua Appia, was built by Appius Claudius, and was about ten miles in length. Other aqueducts were constructed from time to time, as the growth of the city required.

At the time of the Emperor Claudius, about A. D. 52, Rome was being supplied with water by nine different aqueducts. The two longest, the Aqua Claudia and the Anio Nova, were fifty-eight and sixty-two miles in length, respectively. These aqueducts were all extremely massive and elaborate in construction. The water was conducted in masonry channels, supported for the greater part of the distance upon arches, some of which were more than one hundred feet in height. They were adorned with columns and other architectural ornamentations, and their ruins, together with those that remain in use at the present time, form a distinctive feature of the Campagna.

In Rome, every house was provided with a fountain, or water-tap, and a dwelling was not considered fit for occupancy, even for the poorest class, unless it was furnished with an abundant supply of water.

Among the public works of ancient Rome are mentioned eleven Thermæ, or public baths, eight hundred and fifty-six bath rooms, and one thousand three hundred and fifty-two fountains for public use, in the streets.

Water, so bountifully supplied in ancient Rome, was used freely for all purposes. The practice of frequent bathing became universal, and the magnificent public bathing establishments, or Thermæ, erected under the emperors, are indicative of the extent to which luxurious habits had permeated all classes of Roman society. They covered acres of ground, and besides the arrangements required for bathing, contained refreshment saloons, reading and conversational rooms, concert halls, theatres, and race-courses. They were ornamented with the most costly paintings, mosaics, and statuary.

The Thermæ of Diocletian were begun about A. D. 302. They were about six thousand feet in circuit, and the daily number of bathers is estimated at three thousand. The Thermæ of Caracalla were begun about A. D. 212. The establishment was quadrangular in form, surrounded by a wall. Its length and breadth are stated to

have been one thousand feet, forming a circuit of about four thousand feet. The magnificence of the establishment was unparalleled. The accommodations were sufficient for the wants of one thousand six hundred bathers at once.

The works for the sewerage of Rome were equal in magnitude to those for its water supply, but, being underground and destitute of architectural beauty, they have not left imposing ruins, as have the aqueducts.

The Roman sewers have passed into oblivion as a system. Ancient sewers are discovered from time to time, and are now frequently used, but it is seldom known where they lead.

The most notable example of the ancient sewers, the Cloaca Maxima, or main outfall sewer of Rome, was built by Tarquinius Prisius about six hundred years B. C. It is the earliest known application of the arch principle in Rome, and has defied the vicissitudes of more than two thousand four hundred years. It is still used for the purpose for which it was built. It is about fourteen feet in width and thirty-two feet in height. The arch which covers it is semicircular, and formed of three concentric rings of stone called peperino, laid without cement.

On examining the ruins of the various buildings, we find admirable and ample provision for their drainage, and, what is of far more importance, a dimension given to the sewers sufficient to render them effective. Their sectional area was increased as they advanced, and there appears to have been in Rome one general direction which proportioned the parts as well as the whole.*

Not only in the imperial city, but in every province of the Empire, the Romans constructed works of great magnitude for the water supply and sewerage, as many ruins of Roman works in Italy, Spain, France, Germany, and England still testify.

DECLINE OF SANITARY SCIENCE IN THE MIDDLE AGES.

During the wars and political disturbances that followed the fall of the Roman Empire, public works of all kinds were neglected and allowed to pass into decay.

With increasing ignorance and poverty, sanitary precautions were disregarded, and slovenly and filthy habits prevailed. The doctrines of asceticism and of corporeal mortification, promulgated at this period, were carried to the extreme of physical endurance by their

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* Cresy, Ency. Civ. Eng.

votaries. Cleanliness of person was looked upon as an evidence of a wicked and self-indulgent life; the practice of bathing was abandoned; clothing was worn without change until it decayed upon the person; filth was permitted to accumulate in the houses and streets until the latter were full of reeking abominations. The water supply, which was mainly obtained from wells, was, in time, so polluted by the foul saturation of the soil as to be absolutely unfit for use.

A terrible retribution followed this defiance of natural laws. History records the repeated devastation of Europe by epidemics during this period. The "Great Mortality," or "Black Death," which prevailed from A. D. 1347 to 1350, originating in the far East, approached through Asia Minor and Egypt, and ravaged in succession the various countries of Europe. It may be assumed without exaggeration, that Europe lost during the "Black Death" 25,000,000, or one quarter of its population.*

REVIVAL OF SANITARY SCIENCE.

The great fire of London in 1666, in itself a calamity of the first magnitude, did great good, indirectly, in many ways.

After the fire, some attention was given to the construction of drains for removing the surplus waters of the city, which had hitherto been allowed to flow over the surface. These drains were of very rude construction, and when covered, were invariably of such a size that men could enter them and remove the deposits that were constantly collecting.

After the general introduction of water-closets, about the commencement of the present century, fæcal matter was admitted into the public drains. "Up to about the year 1815, it was penal to discharge sewage or other offensive matters into the sewers; cesspools were regarded as the proper receptacles for house drainage, and sewers as the legitimate channels for carrying off the surface waters only. Afterwards it became permissive, and in the year 1847 the first act was obtained making it compulsory to drain houses into sewers."†

The construction of systems of impervious, self-cleansing sewers is to be dated from this time. Those previously built had not been of this character; they were merely underground channels of masonry or brick-work, through which water was expected to flow, built without much regard to the laws of hydraulics and with little or no effort to make them water-tight.

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* Hecker, Black Death in the 14th Century. † Bazalgette, Proc. Inst. C. E., Vol. 24, p. 282.

RESULTS ACHIEVED BY MODERN SANITATION.

The effect of the construction of modern systems of sewerage in impoving public health, as shown by the reduction of the rate of mortality, has been very remarkable.

The following extract from an address of Capt. Douglas Galton at the Fifth Congress of the Sanitary Institute of Great Britain contains some important facts:—

"It may be accepted as certain that in every case where the sewerage of towns has been devised on sound principles, and where the works have been carried on under intelligent supervision, a largely reduced death-rate has invariably followed. The records of Newcastle afford evidence of this fact. The quinquennial period beginning in 1868 showed a death-rate of 27.6; the quinquennial period ending in 1881 showed a death-rate of 23; whilst the death-rate of 1881 was only 21.7."

"At the recent Sanitary Congress at Vienna, some remarkable results of the effects of the sewerage of certain German towns were given, which are very striking."

"Munich is the residence of one of the ablest sanitarians of Europe, Dr. Pettenkofer. His admirable illustrations of the effect of the impurities which were accumulated in porous cesspits upon the air of the town, and the death-rate of the population, form a text-book of sanitary knowledge."

"At Munich, the enteric fever mortality *per 100,000 of inhabitants* for quinquennial periods was as under:—

1854 to 1859, when there were absolutely no regulations for keeping the soil clean	24.2
1860 to 1865, when reforms were begun by cementing the sides and bottoms of porous cesspits	16.8
1866 to 1873, when there was partial sewerage	13.3
1876 to 1880, when the sewerage was complete	8.7

"Similarly at Frankfort-on-the-Main, the deaths from enteric fever *per 10,000* were:—

1854 to 1859, when there was no sewerage	8.7
1875 to 1880, when the sewerage was complete	2.4

"At Dantzic, the figures present some more striking characteristics; the deaths from enteric fever *per 100,000 living* were as follows:

1865 to 1869, when there was no sewerage and no proper water supply	108
1871 to 1875, after the introduction of water supply	90
1876 to 1880, after the introduction of sewerage	18

"Hamburg has been drained by Mr. Lindley, and he has stated that in his plans he carefully followed the principles laid down by Mr. Chadwick. In that town, the deaths from enteric fever *per 1,000 of total deaths* were:—

From 1838 to 1844, before the commencement of the construction of any sewerage works	48.5
From 1871 to 1880, after the completion of the sewerage works	13.3

"During the time that the works were in progress, viz: from 1872 to 1874, the mortality from enteric fever *per 10,000 living* was:—

In the unsewered districts	40.0
In the districts for the most part sewered	32.0
And in the fully sewered districts	26.8

"These results illustrate the effect of purifying the air of towns by the rapid abstraction of refuse matter, so as to prevent it from remaining and putrefying in and upon the ground."

Mr. Edwin Chadwick, C. B., one of the ablest and most experienced English sanitarians, writes concerning the benefit derived in England from sanitary measures as follows:—*

"Our kinsfolk in the United States have carried with them the erroneous practices prevalent here at home before sanitary science was known, and object to the cost of removing them. It is well that they should be made aware of the greater cost of retaining them."

To show the money gain, as well as the gain in health and life, achieved in England by sanitary measures, as yet incomplete and rudimentary, he adds:—

"Since the International Medical Congress was held, the report of the Local Government Board has appeared, and contains a statement of the progress of sanitary work in England and Wales . . . as follows:—

'Before concluding the part of our report which relates to sanitary administration, it may be useful to draw attention to the annual death-rate for some years past as indicating the effect which recent sanitary measures would appear to have had upon the public health.'

* Sanitary Engineer, Vol. 4, 1881.

'The following table shows the death-rate for each of the four last decennial periods:—

England and Wales.	Annual death-rate per 1,000.			
	1841-1850.	1851-1860.	1861-1870.	1871-1880.
All causes....................	22.4	22.2	22.5	21.5
Seven zymotic diseases.........	....	4.11	4.14	3.36
Fever........................	....	0.91	0.88	0.49

'From the above figures, it will be seen that, speaking generally, the death-rate of the country remained stationary from 1840 to 1870, but that in the period 1871–80 it fell from 22.5 (of the previous decade) to 21.5; a reduction equivalent to nearly 4½ per cent. It may, therefore, be roughly estimated that about 250,000 persons were saved from death in the ten years 1871–80, who would have died if the death-rate had been the same as in the previous thirty years. If twelve cases of serious but non-fatal illness be reckoned for every death, it follows that about 3,000,000 persons, or over one ninth of the whole population, have been saved from a sick-bed by some influences at work in the past decade which had not been in operation previously. . . .

'Comparing then 1861–70 with 1871–80, it will be seen from the foregoing figures, that, of the entire reduction of 1.0 in the death-rate, more than three quarters (4.14—3.36=0.78) come under the head of "the seven zymotic diseases"; of the diseases, that is, which are most influenced by sanitary improvements, and most amenable to control by the action of sanitary authorities. And of this three quarters, just half (0.88—0.49=0.39), or three eighths of the entire reduction, is in "fever"; the disease which, more than any other, shows itself in connection with such faults of drainage, of water supply, and of filth accumulation as it is within the province of good sanitary administration to remove.'

'During the decade from 1861 to 1870, there appeared to be no gain from the outlay on sanitary works or on sanitary service in England and Wales; but since then the service appears to have made an effective start, and the pecuniary gain may be thus stated: Under the inquiry as to interments, the cost of funerals—all round—was

ascertained to be £5 ($25.00) each. The gain under that head will, therefore, be about £1,000,000 ($5,000,000), by the 250,000 funerals saved during the last decade. The direct cost of sickness has been estimated at about £1 ($5.00, per case. The gain under that head during the decade will, therefore, amount to about £3,000,000 ($15,-000,000); a gain, that is to say, by a reduction of medical treatment and other expenses. But the gain to the wage classes from the saving of lost labor will have been far greater. . . .

"A reduction of the death-rate by four and one half per cent is only an instalment of sanitary progress. Thus, in the instance of Croydon, visited by the delegates of the Congress, the death-rate has been reduced from twenty-five to sixteen per one thousand, chiefly by the methods introduced by the first General Board of Health. . . . On the demonstrations of various model instances, it may be held that the reduction of the general death-rate by four and one half per cent, as reported, satisfactory as this is, cannot be considered more than one third of the results obtainable by advanced sanitary administration and further sanitary works. The pain and misery and the social disorder occasioned by excessive sickness and premature mortality are generally beyond pecuniary estimation."

Among the causes which have operated in England to produce these remarkable results may be mentioned the construction of more perfect systems of sewerage and house drainage, the gradual disuse of cesspools and wells, the introduction of more copious water supplies, the more efficient scavenging of towns, and sanitary inspection of dwellings, and the purification and utilization of sewage.

SEWERAGE SYSTEMS.

GENERAL PRINCIPLES.

The cardinal principles upon which the sanitation of towns should be based may be briefly stated as follows:—

1. The water supply should be both pure and abundant.

2. All excretal filth, domestic refuse, and dangerous waste products of manufactures should be completely removed beyond the limits of inhabited districts, and be properly disposed of, before any deleterious putrefactive change shall have taken place in them.

3. The process adopted for the removal of objectionable matters should be such that the apparatus, channels, or rivers by which they

are conveyed shall not become foul nor communicate any gaseous products of decomposition to inhabited places. No system of sewerage is complete until all nuisances from sewage shall have been prevented.

4. The scavenging of the town should be complete and thorough.

5. The storm water should be conveyed without damage or inconvenience.

6. The level of the underground water should be permanently lowered, by means of thorough subsoil drainage, to a suitable depth below all habitations.

7. A code of effective sanitary laws should be enacted and enforced, and an efficient sanitary inspection should be constantly maintained.

WHAT IS SEWAGE?

The word *sewage* is commonly understood as meaning the foul fluids that are conveyed by sewers, and which vary in their offensive character, from the fetid overflowings of privies to the diluted liquids found in the sewers of large cities. Its meaning, however, is extended in sanitary discussions to include the more solid forms of excrement and filth, without regard to the degree of their dilution or the possibility of their removal by flow. It does not, however, include those solid refuse matters which may be used for animal food, as kitchen garbage, nor those which, like ashes, have no tendency to decomposition.

The sewage usually found in city sewers is of a very complex character. "A large proportion of its most offensive matters is of course human excrement, discharged from water-closets and privies, and also urine; . . . but, mixed with this, there is the water from kitchens, containing vegetable, animal, and other refuse, and that from wash-houses, containing soap and the animal matters from soiled linen. There is also the drainage from stables and cow houses, and that from slaughter-houses, containing animal and vegetable offal. In cases where privies and cesspools are used instead of water-closets, or these are not connected with the sewers, there is still a large proportion of human refuse in the form of chamber-slops and urine. In fact sewage cannot be looked upon as composed solely of human excrement diluted with water, but as water polluted with a vast variety of matters, some held in suspension, some in solution."*

* First Report Rivers Pollution Com. (1868), Vol. 1, p. 13.

The liquid wastes from manufactories, which are frequently permitted to flow into sewers, sometimes produce a remakable effect upon the appearance of the sewage; for example, the color of the sewage of Coventry, England, depends materially upon the amount of waste dyestuff present. It is frequently very highly colored.

The methods in use for the removal of sewage may be divided into three general classes:—

1. Sewage interception systems; or dry-sewage processes.
2. The pneumatic systems.
3. The water-carriage system.

SYSTEMS OF SEWAGE INTERCEPTION.

The term *interception*, in connection with the subject of the dry removal of sewage, means the exclusion from the sewers of fæcal matters; the sewers being used only for the removal of surface water and slops, with or without the admixture of urine.

All interception systems partake of the nature of scavenging, inasmuch as they contemplate the accumulation of the sewage and its periodic removal by horses and carts. They differ in the methods and apparatus employed.

SOIL POLLUTION.

The old-fashioned privy vault and cesspool cannot be too strongly condemned. Constructed for the avowed purpose of retaining the solid matters as long as possible upon the premises, they become centres of pollution and infection. The liquid portions, escaping, pollute the soil and neighboring wells; the noxious exhalations arising from their putrefying contents contaminate the air.

The extent to which the contents of a leaking cesspool or privy may pollute the soil is well illustrated by the following:—

"At Charlbury, in consequence of the escape of the contents of a barrel of petroleum or benzoline, which had been buried in an orchard, a circuit of wells sixty feet below and seven hundred and fifty to nine hundred feet distant, became so affected that the occupiers of fifteen houses, containing eighty-two inhabitants, were for ten days unable to use the water for drinking or cooking. The cattle of one of the proprietors, moreover, refused to drink at the spring where they were accustomed to drink. Had this soakage been sewage instead of petro-

leum, who can doubt that the result might have been wholesale water poisoning and an outbreak of typhoid fever?"*

The more important modern methods of interception are:—

1. The improved form of privy vault.
2. The pail or tub system.
3. The earth-closet system.

THE MODERN PRIVY.

The improved form of privy was reached by several successive modifications. It was first made impervious by constructing it of more suitable materials; an overflow connected with the sewer being provided to carry off the surplus liquids. Then it was arranged so that some cheap deodorizing substance, such as coal-ashes, could be scattered upon the excreta. A more important step was the contraction of the size of the vault to a small space beneath the seat, thereby necessitating more frequent removals of its contents. In some cases, a trough was placed under the front part of the seat to separate the urine from the solids.

* * * * * * * *

THE PAIL SYSTEM.

This system consists in the use of small movable receptacles beneath the privy seat, instead of the permanent receiver of the improved privy vault. In its simplest form it consists of a wooden box into which the excreta fall, and which, when full, is emptied into a cart and replaced under the seat. The more usual method, however, is to place a fresh box under the seat, the full one being taken away to be emptied and cleansed.

The difficulty of thoroughly cleansing rectangular boxes led to the substitution of round or oval tubs and pails.

A further modification, the Goux system, consists in lining the bottom and sides of the tub with a layer of loose absorbent materials, kept in place by a movable core or plug, which is removed just as the pail is to be placed under the seat. "All kinds of vegetable and animal fibrous matters, useless for other purposes, are used as absorbents. They are to be mixed in such proportions as may be most convenient, together with a small percentage of sulphate of lime."

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*Child, G. W. Report, etc., *see* Lancet, 1874, Vol. 1, 841.

Dry rubbish and ashes must be put into some other receptacle. Chamber slops may be emptied into the privy tub. When the fluids exceed the absorbent capacity of the lining, the advantages of the process are impaired or lost. The tubs should, therefore, be emptied quite often.

"There would appear to be but little gain by the use of the Goux lining, as regards freedom from nuisance, and, though it removes the risk of splashing, and does away with much of the unsightliness of the contents, the absorbent, inasmuch as it adds extra weight, which has to be carried to and from the houses, is rather a disadvantage than otherwise, from the manurial point of view."*

The pail system is extensively used at Rochdale,* Birmingham, Manchester, and other places in England.

At Rochdale, the tubs are made of paraffine casks, cut in two and supplied with handles. A strong cast-iron rim is fixed on the inside of the tub, about three inches down, to receive the inner lid.

At Birmingham, galvanized tubs are in general use.

The privies at Rochdale are all numbered consecutively in a district register. By a good system of accounts, the work of the scavengers is checked, and any omission is at once detected. The whole work is done in the daytime, and every closet is emptied weekly. When a tub is removed, it is covered with its lids, and a fresh tub is left in its place. The privies are provided with a door opening into the passage in the rear of the house, by which access is had to the space beneath the seat. The full tub is placed in a wagon holding twenty-four tubs, and provided with doors with air-tight rubber joints. In 1874, five such wagons, in full work, collected weekly from 3,354 *privies* in all parts of the town. In 1875, the number of *pails* used was 4,741; in 1876, 5,566.†

At Rochdale, a separate cart accompanies the tub wagon, to collect the ashes and house refuse, which are placed in a special tub. Three such carts, in full work, collected weekly, in 1874, from 3,354 ash places throughout the town.§

The excreta are carried by the carts to some general place of deposit, where they are subjected to the final process of treatment. This varies somewhat at different places.

At Birmingham, where the process has been carried to the greatest perfection, the pails are emptied into a vat as soon as they reach the

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*Redgrave, Proc. Inst. C. E., Vol. 45, 135 and 136.

† Taylor, Proc. Inst. C. E., Vol. 45, 177.

§ Redgrave Proc. Inst. C. E., Vol. 45, 137.

place. A certain amount of sulphuric acid is here added to fix the ammonia. The vat is then emptied, the contents passing into a drying machine, which consists of a steam jacketed cylinder, within which are revolving arms, which keep the contents continually agitated. The material, when dried, is in the form of a coarse, moist powder, and is bagged for sale.

The heat required is obtained almost entirely by burning the cinders and garbage collected in the town, which are brought to the same establishment for disposal. The rubbish is examined, and anything of value is picked out, such as rags, bones, old iron, tins, bottles, etc. These are piled separately and sold. The "clinker," resulting from the combustion of the cinders and garbage, is ground to powder, and used as an ingredient for making cement mortar, and for other purposes.

The number of pails in use at Birmingham at the present time is about 40,000, representing a population of 250,000. Their contents are collected weekly. The number of pails is said to be increasing.

At Manchester, the works are of a cruder sort, but the process is essentially the same.

The pail system, at its best, is an offensive method for the collection and disposal of excreta, and its nature is such that it would not be tolerated in any community in this country.

THE EARTH-CLOSET SYSTEM.

Under this head are considered the various systems by which pulverulent deodorizers are applied to the excreta during their storage upon the premises. These systems may or may not include a moveable receptacle or pail.

The most important types are:—

1. The earth-closet proper.
2. The ash-closet.
3. The charcoal-closet.

The dry-earth system for the removal of sewage was designed and perfected by the Rev. Henry Moule, M. A., vicar of Fordington, Dorset. It is thus described by Dr. Buchanan:—*

"It consists in the application, with the greatest procurable detail, of dry earth to fresh human excrement, and in the subsequent removal and use of the mixture for agricultural purposes. In so far as

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* Twelfth Report Medical Officer of the Privy Council, 1869.

detailed application is not made, or as the earth is not dry, or the excrement not fresh, or the mixture otherwise dealt with, the dry-earth system is departed from. . . .

"As regards the principle of the earth-closet, the evidence as to the powers of dry-earth is unequivocal. If about a pound and a half of suitable earth, carefully dried, be thrown over a dejection, all smell from it is forthwith removed; and if the same quantity be mixed with half a pint of urine, the latter is absorbed. The mixture of earth with stool and urine is not only inoffensive when fresh, but remains so after keeping for two or three months, or longer."

"The process which goes on in the mixture, is obviously one of disintegration and of some combination between the earth and the organic matter, as is evidenced by the disappearance of stools and even of paper among the other constituents of the compost. But the absence of fœtor from the mixture of earth with stool or urine, even with prolonged keeping, shows that decomposition in the ordinary sense does not take place. . . .

"In order that the described result shall be efficiently brought about, the quantity and quality of the earth have to be considered. With any quantity materially less than a pound and a half to the average dejection (or unless some artificial means not generally applicable of mixing are had recourse to), a tendency to wetness remains, and more or less fœtor results. If much more earth is used, the proportionate agricultural value of the product is lessened. The quality of earth as affecting its power of producing an inoffensive compost with excrement is of at least equal importance with its quantity. Sand and gravel have almost no power in this respect. Chalk has very little. Clay stands very high in rank. Properly dried it falls readily into a convenient powder, which has great power of absorption, and of preventing offensive change. High in rank also is surface earth, that which is loamy being preferable to any of peaty character. One of the best of all earths is the brick earth of the drift. Earths which already contain some quantity of organic matter are very suitable. . . .

"The mixture of excrement with earth, after being kept awhile and then dried, has again the power which the original earth possessed of absorbing and making inoffensive any stools and urine to which it is applied. This power is so marked that it has repeatedly been alleged to me that the earth (especially if clay) acts better a second time than the first; and I can answer from my own observa-

tion that earth used three or four times over, with drying at the proper stages, will render excrement quite inoffensive. . . .

"This power of using earth several times over. . . . has an important economical bearing upon the applicability of the system. . . . The limits of this power do not appear to have been reached, but, for experiment's sake, the earth has been employed a dozen and more times over, when it must have come to have more than half its bulk of excrement, with the same result on the dejections as at first, but with the other result of getting a manure too strong for use by ordinary methods to the land."

Opinions differ concerning the value of earth-closet compost as manure. Dr. Buchanan* estimates its value at £3 per ton, for "earth that has been *three* times through the closet." He also cites the opinions of two farmers who estimated by actual trial that the earth which had passed *once* through the closets had "a minimum agricultural value of £3 per ton." On the other hand, Mr. Radcliffe, writing in 1874, after stating that the opinion held at the time (1869) when Dr. Buchanan made his inquiry still prevailed, added:—†

"Drs. Gilbert and Voelcker, studying the question chemically, have shown that the earth-closet manure after it has been charged twice, or even thrice, is no richer than good garden mould."

The form of an earth-closet is immaterial. It consists of a seat with a receptacle beneath for the excrement, which is preferably impervious and movable, but may be fixed. The closet may be out of doors, or may be a portable cabinet in the bedroom.

THE ASH-CLOSET.

This closet is similar to the earth-closet in its object, the difference being that sifted coal-ashes are used, instead of dry earth, to deodorize the excreta. Its action is not as efficient as earth, nor is the resulting compost as valuable. The defects arising from the imperfect action of coal ashes as a deodorizer have been urged, unjustly, against the earth-closet, of which the ash-closet is but an imperfect imitation.

THE CHARCOAL-CLOSET.

The valuable deodorizing properties of charcoal have led to its application to the dry removal of sewage in a manner similar to the

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* Buchanan, *loc. cit.*

† Radcliffe, 2d Report of Medical Officer of Privy Council, 1874.

earth-closet method. Charcoal made from street sweepings and from seaweed have both been employed for the purpose. With the latter kind of charcoal, the development of the method into a system has been attempted.

The system contemplates the charring of a mixture of excrement and seaweed charcoal, thus making a new grade of charcoal, which may be afterwards used to deodorize excrement. Certain valuable chemical products are also obtained during the charring process.

The charcoal may also be converted into a valuable manure. The weight is increased, at each reburning, and all the potash and phosphates of the excrement are retained.

The quantity of charcoal needed to thoroughly deodorize excrement is about one fourth, by weight, of the dry earth necessary for the same purpose. In case the urine is kept separate from the solids, from one half ounce to three fourths ounce is sufficient for each use of the closet. Thus an important advantage is gained over the dry-earth system, by reducing the weight of the material to be removed. Chamber slops and sink water should be excluded from charcoal-closets.

Charcoal-closets have been used in Glasgow and vicinity with a certain degree of success.

CONCLUSIONS AS TO SEWAGE INTERCEPTION.

From a sanitary point of view, all sewage-interception systems are imperfect, since they require the excreta to be stored about the premises for a certain period, longer or shorter according to the system employed. As sewage begins to putrefy in two or three days, to obtain the best sanitary results it is essential that it be speedily and completely removed. This condition cannot be complied with by any system of sewage interception without great inconvenience to the household.

Nevertheless, there are households and communities whose sanitary conveniences are so imperfect that the introduction of a good system of sewage interception would be considered a great blessing. Such may be found in country residences, and villages where an efficient water supply and system of sewerage are impracticable on account of cost or other considerations.

Sewage-interception systems are imperfect from an engineering and economic point of view, because they fail to provide for the removal of chamber slops and sink water, and dispose of the urine to a limited

extent only. Neither do they provide for the drainage of the soil nor for the removal of surface water. Thus it is seen that the establishment of a perfect system of sewage inteception does not relieve the community from the necessity of constructing a complete system of sewerage for the removal of these liquid wastes. The cost of such a sewerage system would not be affected by the exclusion of the fæcal matters, their volume being relatively small.

It has also been proved by chemical analyses that the exclusion of human fæces from the sewers has a very slight effect upon the composition of the sewage. This conclusion was reached by the second Rivers Pollution Commission, after an examination of the sewage of fifteen towns in which fæces were excluded from the sewers, and of sixteen towns in which water-closets were used.* Thus it is seen that the cost of an interception system would be an additional and unnecessary expense in towns that have reached that stage of development in which sewers for the removal of liquid wastes have become a necessity.

THE PNEUMATIC SYSTEMS.

THE LIERNUR SYSTEM.

The object of the pneumatic systems is to remove sewage to some central depot as frequently as may be desired, without the annoyance of scavengers, and without its excessive dilution by the admixture of water, which increases the difficulty and expense of manufacturing a dry manure from it.

The most widely known pneumatic system is that of Capt. Charles T. Liernur, which has been used in Holland, in portions of Amsterdam, Leyden, and Dordrecht, and also to a limited extent in Prague and Hanau.

The Liernur system consists, primarily, of a net-work of cast-iron pipes, jointed like water mains, and completely air-tight, for the removal of fæces, urine, and chamber slops from dwellings, and the entire drainage from hospitals, by pneumatic suction. Secondly, it contemplates the removal by gravity of domestic, kitchen, and laundry slops, the rain-water from roofs, yards, and streets, and the drain-

* First Report, Rivers Pollution Commission (1868), Vol. I. (1870), page 30.

age of the soil, by means of an entirely distinct system of pipes or sewers. This second system, although an integral part of the general scheme, has never been constructed in the places using the Liernur method.

The pneumatic pipes are usually of the same diameter, five inches, throughout the entire system. Those from the closets in the houses connect with the pipe in the street, which leads to a small, air-tight, cast-iron reservoir (Plate V, Fig. 2, and Plate VI,) placed at the intersection of the streets. This reservoir receives the sewage from a certain district of houses. The several street pipes connected with it are each furnished with a stopcock to control the vacuum.

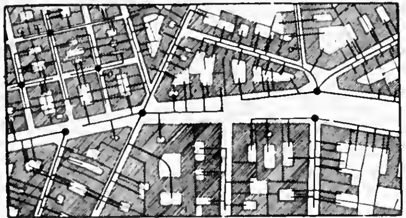
At some convenient place a general collecting station is established, provided with large air-tight reservoirs. Here a steam-engine operating an air-pump produces a partial vacuum in the large reservoirs and in main pipes connected with them, laid in the principal streets. The main pipes are joined to the street reservoirs by two connections, each having its stopcock. One of these, merely passing through the top of the street reservoir, serves to exhaust the air; the other, passing into its interior and nearly to its bottom, is used to extract the sewage.

The operation then is as follows: "The air-pump in the central building maintains during the day a vacuum in the reservoirs underneath, and in the whole length of the central pipes connected therewith. Patrols of two men each parade the district. Coming to a street tank, they open the lids by which access is given to the cocks which shut off each pipe from the tank; one man fixes his key upon the cock connecting the central or vacuum pipe with the tank, and the other has his upon the cock belonging to one of the street main pipes leading to the houses. The moment the first man turns his key he opens the connection between the central station and the tank, the air contained in which is at once exhausted and a vacuum established, the extent of which is indicated by a small vacuum meter. He then shuts the cock, while the other man, by turning his key, lets loose the force upon one of the pipes leading by its branches to the houses. This action repeated once or twice brings the fæcal matter into the tank.

"In the same way, a second, third, and fourth pipe, each leading to different streets, may be dealt with, and the whole fæcal products of the little drainage district belonging to the tank be thus collected in it. Before leaving the tank, the matter must be despatched to the central station; and this is done by simply opening the second

Details Of Parts Of
Liernur's Sewerage System

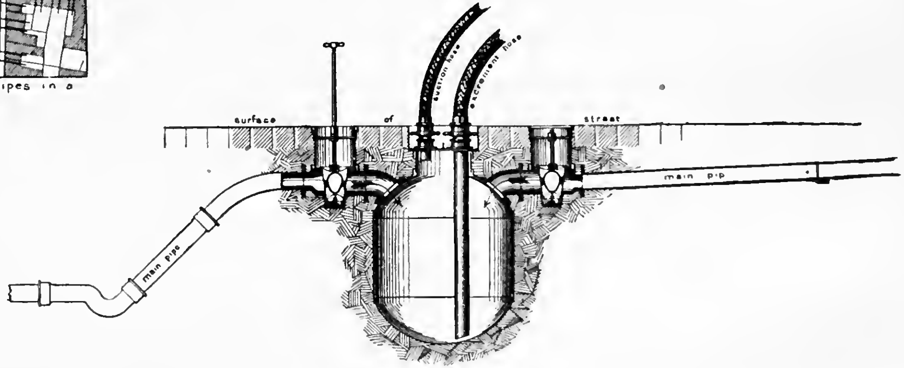
Scale $\frac{1}{40}$



General Plan of a Pneumatic System of Pipes in a City District

● Reservoirs ——— Pipes

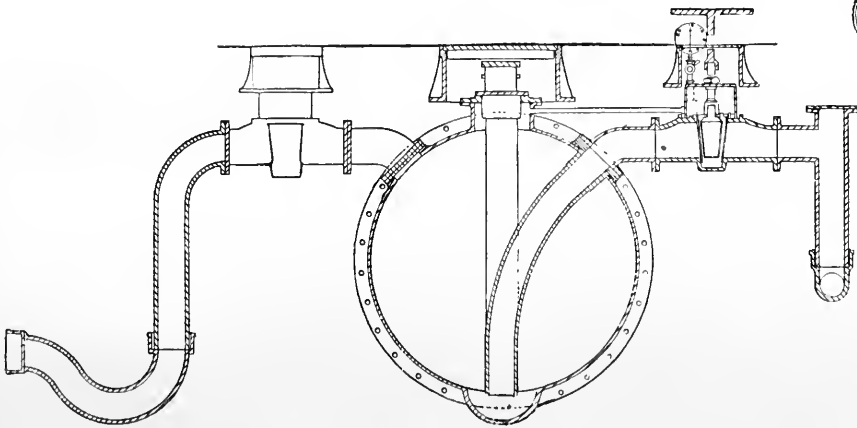
FIG. 1



STREET RESERVOIR

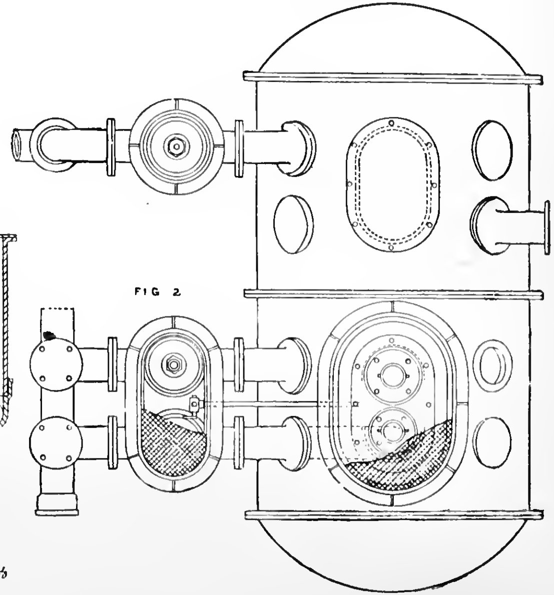
FIG. 2

FIG. 1



SECTIONAL ELEVATION

FIG 2



PLAN

Scale $\frac{1}{25}$

STREET RESERVOIR OF LIERNUR'S SEWERAGE SYSTEM
IN USE AT AMSTERDAM HOL.

PLATE VI

connection of the vacuum pipe, which dips into the well of the tank, when all the matter is at once sucked up and despatched towards the central station."

During the construction of the pneumatic system, and before the establishment of the central station, the street resorvoirs may be operated by a portable steam air-pump and an air-tight tender, in which latter the excreta may be removed.

Works are being constructed at the central station in Amsterdam by which the sewage will be evaporated to dryness by means of superheated steam and special machinery, the product being a dry manure or *poudrette*.

At present, the fæcal matters are barrelled for use as liquid manure and removed by boats.

An interesting and important feature of the Liernur system is the method adopted to preserve the vacuum in the pipes and to secure the removal of the sewage. It is impracticable to move liquids wholly by means of air pressure through horizontal pipes, or those inclined downwards. Air pressure, on the contrary, will raise liquids without difficulty through vertical pipes, or those inclined upwards. The pneumatic pipes of the Liernur system are consequently laid in a series of undulating grades, having rises, up which the sewage is raised by suction, followed by declivities, down which it flows by gravity.

All the branch pipes leading from the houses to any given street main are so arranged as to have a uniform suction lift, or step, so that the sewage has to be raised an equal amount in every instance. Consequently they are all *emptied simultaneously* at the instant when the suction is strong enough to overcome this resistance, which is uniform throughout the district. The sewage, however, *commences* to flow from the houses at different instants according to the quantity which has accumulated.

Two varieties of closets may be used in connection with the Liernur system. Persons accustomed to the water-closet, or desiring one that shall be cleansed with water, are supplied with a closet which, by certain mechanism, is flushed by a limited amount of water every time it is used. The quantity is limited to prevent the dilution of the fæcal matters.

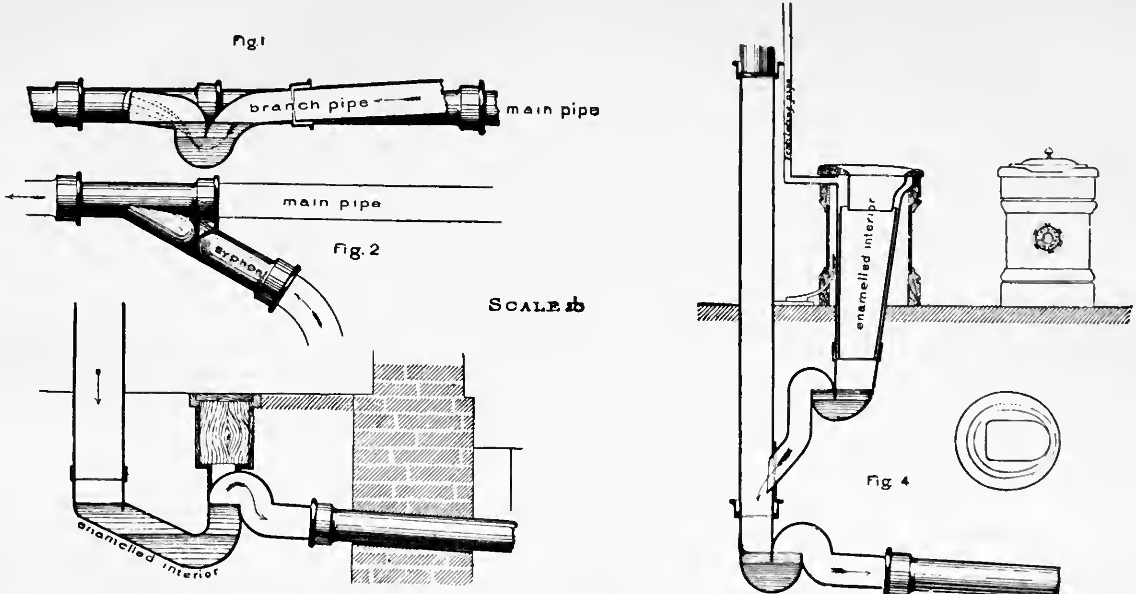
The closets for the use of the lower classes are, however, of a different character. They have no movable mechanism, and are used

without any water whatever. The pneumatic privy (Plate 7, Fig. 5) consists of a hopper with a concentric flange at its top, the annular space between them being ventilated by a small pipe running to the top of the house and furnished with a ventilator at its upper end. The hopper is so shaped that the fæces fall directly into a trap beneath without touching its sides. The trap always remains full of fæcal matter, and overflows by gravity into an inclined pipe, which discharges into the soil pipe. The odors arising from this fæcal trap are expected to pass up the small ventilating pipe to the outer air, and not through the opening in the seat into the room ; an expectation which, it is said, is often unsatisfied. The throat of the trap is made smaller than the soil pipe, to prevent large foreign substances from getting into and obstructing the pipes. Both forms, the water-closet and pneumatic closet, discharge into the soil pipe which leads to the pneumatic trap or step, in the house drain. It is this latter trap only which is emptied periodically by the vacuum. The soil pipe extends upwards to the open air, its open end supplying the air necessary for the pneumatic action.

Opinions concerning the Liernur system differ greatly, according to the standpoint from which it is viewed.

In Holland, where the lowness and flatness of the country render the subsoil drainage of towns impracticable except at an enormous cost, and where their surface drainage forms a part of the general drainage system of the country, the Liernur system has reached its greatest development. In other localities where these conditions do not exist, the Liernur system would prove excessively expensive, requiring, as it does, a duplicate set of sewers for the removal of kitchen slops, storm and subsoil water, the details and cost of which would not be essentially affected by the exclusion from them of the fæcal matters.

In 1876, an expert committee, appointed by the Local Government Board of England to inquire into the several modes of treating town sewage, reported concerning the Liernur system : "One of the most complicated and costly processes for dealing with the solid of human excreta (not with town sewage) is the system known by the name of the inventor, Capt. Liernur. The pneumatic system has been partially introduced at Leyden, Amsterdam, and Dordrecht, where we have seen it working. These towns are flat, and are intersected by canals and open water-courses. The towns are not sewered on the English plan, but have surface gutters along the margins of the footwalks, into which surface water flows and the inhabitants throw their



DIAGRAMS SHOWING ARRANGEMENT OF
LIERNUR'S SEWERAGE SYSTEM
in Private Houses

waste water and liquid household refuse. . . . If the towns of Holland, or portions of such towns, by reason of peculiarities of site and climate, cannot be sewered on English principles, and if the pneumatic system is as cheap as any of the movable pail systems, it may be the best, under such conditions, for Holland, because, if worked in accordance with the rules laid down, the excreta will be removed daily without the intervention, trouble, and dirt involved in the pail system. . . . We do not know one English town in which the apparatus, if adopted, would be other than a costly toy."

THE BERLIER SYSTEM.

This system is of more recent origin than the Liernur, and has been developed from the necessities of the city of Paris, where it has been introduced for trial on a limited scale.

The sewers of Paris receive the surface and subsoil water, the sink drainage of the houses, and, to a small but increasing extent, the urine, and the overflow from cesspools, etc. The fæces have until very lately been excluded entirely from them ; but, by a recent resolution of the Commission on the Sanitary Improvement of Paris, such matters have been allowed to enter certain sewers where the conditions are favorable to their rapid removal.

Ordinarily at Paris, the fæces pass into water-tight cesspools (*fosses permanentes*), not connected with the sewers, from which they are pumped by pneumatic pressure into cylindrical iron carts, which when full, are tightly closed and driven to the places of deposit. Frequently the fæces pass directly into wooden casks (*fosses mobiles ordinaires)*, there being no cesspool. By the modern system of "*appareils diviseurs*" or "*tinettes filtrantes*," the solids are collected in movable receptacles, from which the liquids overflow either to the cesspool or to the sewer. These movable receptacles are in the cellar, and are connected with the soil pipe by a sliding joint. When full, they are removed, and empty ones are left in their place, after the manner of the pail system, of which this method is a modification.

The inconvenience, nuisance, and danger of infection arising from the emptying of these numerous receptacles and the cartage of so much excrementitious matter through the streets became so great that a change was demanded.

As early as 1861, a pneumatic arrangement was suggested by M. Belgrand, *Inspecteur-Général des Ponts et Chaussées*.

It was afterwards developed into a system by M. Berlier, and was

first tried in 1880, at Lyons, where it successfully removes the sewage a distance of four kilometers, (2.5 miles).

In 1881, M. Berlier presented to the Municipal Council of Paris a scheme for the interception of the excreta from the sewers, and their removal by pneumatic action through an independent system of pipes to a collecting station in the suburbs, and he was permitted to introduce his system, for trial, in portions of the 8th and 17th Arrondissements, a district extending from the Madelaine to Levallois–Perret, a suburb on the northwest side of the city, at which latter place he established a pumping station near the junction of two main intercepting sewers of the Paris gravitation system.

At this station is a steam-engine, an air-pump, and a reservoir or vat for the reception of the sewage. The steam-engine also drives a rotary-pump, which forces the sewage from the vat to an outfall at the river. This disposition of the sewage is merely provisional, the scheme contemplating the pumping of the sewage through pipes to some distant point where it may be utilized. The Berlier system proper ends with the delivery of the sewage into the vat by the pneumatic pipes, the subsequent pumping presenting no unusual features.

The main pneumatic pipe leading from the pumping station is laid within the intercepting sewer from the right bank of the Seine as far as the Place de la Concorde.

Throughout its extent, which is about five kilometers (3 miles), and includes four siphons, its diameter is fifteen centimeters (6 inches).

The pipes leading through the different streets are ten centimeters (4 inches) in diameter. One of these, that in the Rue de la Pépinière, receives the sewage of the barracks in that street, containing about one thousand men. The pipes leading to the houses are also ten centimeters (4 inches) in diameter.

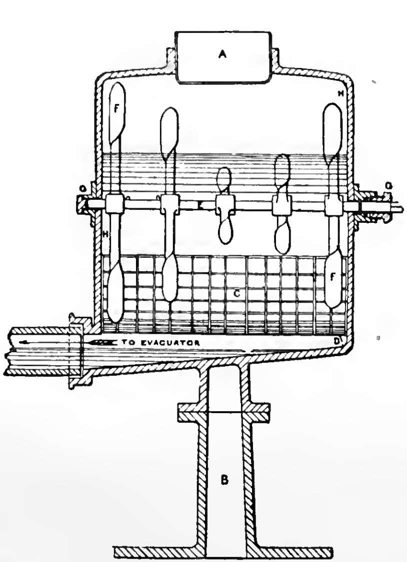
The arrangement within the houses forms a distinctive feature of the Berlier system. The soil pipe is connected with the top of a rectangular iron vessel, or "receiver," placed in the cellar; no modification of existing soil pipes or closets being necessary. The sewage entering the receiver (Plate IX, Figs. 1 and 2)* drops upon a grating of heavy iron wire, with meshes of four centimeters ($1\frac{1}{8}$ inches).

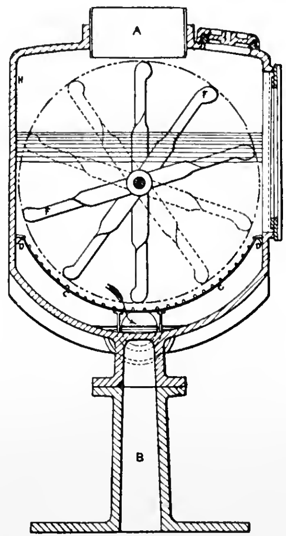
This grating catches and retains any foreign substances which might obstruct the pipes, its meshes being wide enough to permit the passage of ordinary sewage matter. A horizontal axle passes through

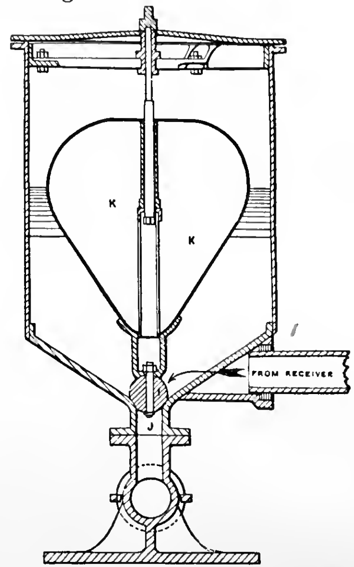
* Adolphe Smith, Pneumatic Drainage (etc.).

PLATE IX

Part of aparatus of J. B. BERLIER'S SYSTEM of pneumatic drainage







A. House drain pipe B. Stand C. Wirework double bottom or strainer D. Supports for strainer E. Axle F. Beaters G. Water tight bearings H. Iron sides of receiver I. India rubber valve J. Outfall communicating neumatic tubes K. Floater.

FIG. 1 SECTIONS OF RECEIVER FIG. 2

FIG. 3

SECTION OF EVACUATOR

the receiver, and is furnished with several arms of different lengths. By turning this axle, the presence of any large object is detected, and it is removed by opening the receiver. The rotation of the arms also serves to agitate the contents of the receiver and break up any masses of fæcal matter that may have accumulated. A person specially employed for the purpose visits the houses at intervals, to inspect the receivers and remove any large object they may have retained.

The sewage passes by gravity from the receiver to another receptacle, called the "evacuator." This (Plate IX, Fig. 3) is a cylindrical iron vessel with a conical bottom, at the apex of which is the pneumatic pipe. Within the cylinder is a large, pear-shaped float, which slides on a vertical rod attached to the top of the cylinder. At the point of the float is an elastic rubber ball, which closes the opening into the pneumatic pipes when the float is in its lowest position; it being held to its seat both by the weight of the float and by the suction of the vacuum which is constantly maintained in the pneumatic pipes. The sewage, gradually filling the evacuator, causes the float to rise when it has reached a certain level, when the contents of the evacuator are immediately sucked into the pneumatic pipes, the opening to which is closed by the dropping of the float before the entrance of any air. Two or more receivers may be connected with one evacuator if necessary.

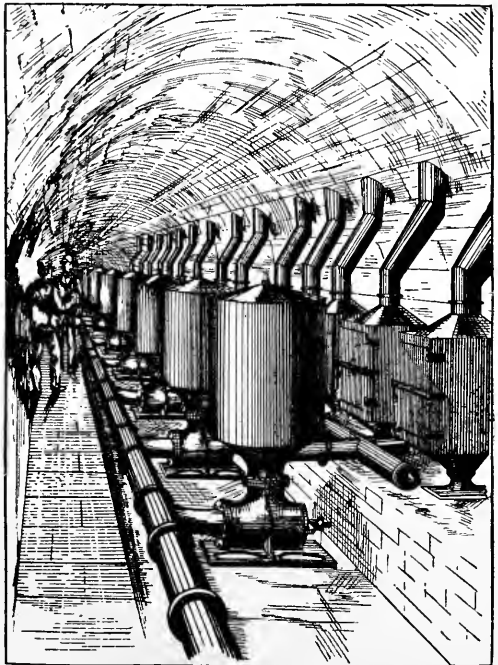
The vacuum required to operate this apparatus does not exceed one hundred and fifty millimeters (6 inches) of mercury. Experiments continued for three months at the barracks of the Pépinière show that a vacuum can be easily maintained in an extensive system of pipes. With the pipes under consideration, which are of cast-iron, united by sleeves and lead joints, a vacuum equivalent to seven hundred millimeters ($27\frac{5}{8}$ inches) of mercury has been obtained in a few minutes.

The action of the sewage within the pipes was observed by placing pipes with glass sides at various points. Throughout the system, the solid matter remains in suspension in the liquid, as if continually stirred. This agitation is produced by the circulation through the sewage of the gases liberated by the reduction of pressure and extracted from it by the air-pump.

M. Berlier designs to finally dispose of the matter gathered at the pumping stations of his system by establishing lines of pipes many miles in length, which, working either under pressure or by vacuum, would convey all the matters to special establishments, at great distances from Paris, where they would be transformed into ammoniacal

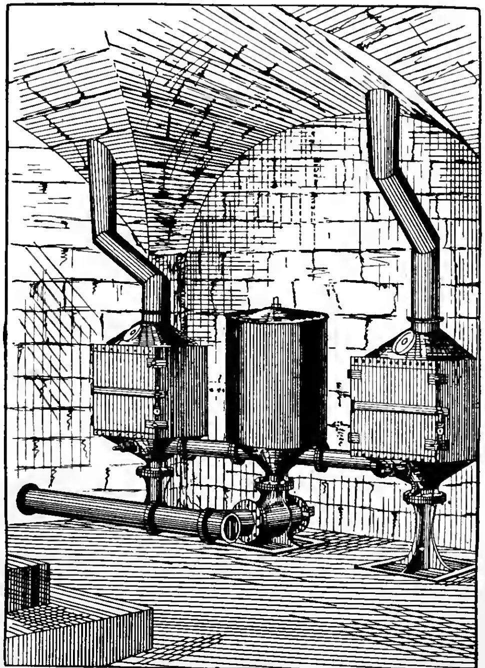
PLATE X

FIG. 1



PÉPINIÈRE BARRACKS

FIG. 2



PRIVATE HOUSE AT Nº 4 RUE DE LA BIENFAISANCE

PARIS.

SKETCHES SHOWING ARRANGEMENT OF THE BERLIER SYSTEM IN PUBLIC AND PRIVATE BUILDINGS

products. He would also provide branch pipes at various places along these main lines which would distribute the matters to those wishing to use them to enrich the soil. He considers that the revenue derived from these two modes of utilization would certainly exceed the interest on the capital invested and the general expenses.

From this description, it will be seen that the Berlier system differs from the Liernur in the omission of the street reservoirs, in maintaining a constant vacuum throughout its pneumatic pipes, and in removing sewage from the premises whenever a sufficient quantity has collected to operate the evacuator. In the Liernur system, the vacuum in the house drains and the consequent removal of the sewage are intermittent, and depend upon the fidelity of the men who periodically visit the street reservoirs.

The Berlier system contemplates the removal of excreta only, leaving the house drainage, the surface water, and the subsoil water to be carried off in a distinct system of sewers. It is the outgrowth of certain local conditions, and, like the Liernur system, cannot be economically introduced where other conditions prevail. The system has not as yet passed beyond the experimental stage. That it possesses sanitary advantages over the methods commonly in use in Paris is shown by the fact that the thousand soldiers in the barracks of the Pépinière, where this system is in operation, were the only troops in Paris that escaped a recent typhoid epidemic.*

THE SHONE SYSTEM.

This, although classed among the pneumatic systems, is a combination of what is technically known as the separate system of water carriage, with a method of pumping sewage by the direct action of compressed air, invented by Mr. Isaac Shone, a mining and civil engineer of Wrexham, Wales. It differs from the pneumatic systems already described by using a plenum instead of a vacuum.

In applying this system to a city or town, the house drainage, comprising excreta and all liquid wastes, is conducted by gravity to a low point in each drainage district, through ordinary sewers, in which nothing else is permitted to flow.

At each of these points is situated a "pneumatic ejector," into which the sewage flows, and by which it is raised, by the direct pressure of compressed air, to any required height, into a system of cast-iron pipes, jointed like water pipes, in which the sewage is forced to the

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* Pall Mall Gazette, April 2, 1883, Adolphe Smith, *loc. cit.*

point of discharge. This may be at the sea-shore, far below the high or low water level, or may be at a sewage farm, where the sewage can be applied to the land. Another arrangement is to deliver the sewage from the ejectors into an upper tier of gravity sewers leading to the outfall. The choice between these two methods depends upon the topography of the locality.

The air which forms the motive-power of all the ejectors is compressed at some convenient place by a compressor operated by steam or water-power. Thence the compressed air is supplied to the ejectors through small iron pipes laid through the streets.

The system is confined to the removal of house sewage both to prevent its dilution, and to render more uniform the volume of liquid to be raised by the ejectors; it being evident that, should storm water and subsoil drainage be admitted, the ejectors would either be unable at times to perform the work required of them, or would need to be so large that they would not work economically under ordinary conditions. Storm water and subsoil drainage are therefore expected to be conveyed in a distinct system of sewers.

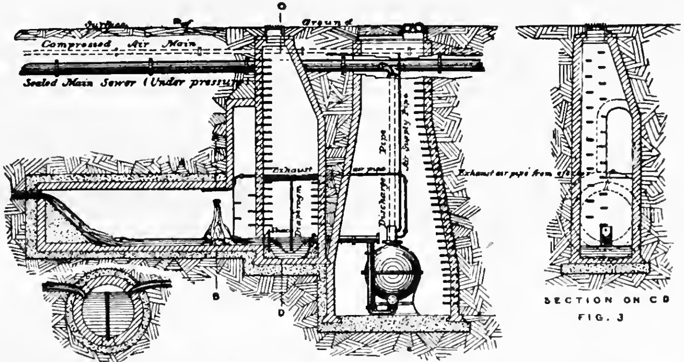
The general arrangements of ejector stations are shown in Plate 11.* In Figs. 1, 2, and 3, the sewage is discharged from the gravity sewers into a receiving chamber, from which it passes into a separating chamber, where all floating substances are arrested, and thence into the ejector. In Fig. 4, the sewage passes directly from the gravity sewers into the ejector.

The ejector is made in several forms, one of which is shown in Plate 12, Fig. 1.,* which represents the ejector empty. The action of the ejector is more readily seen in Figs. 2 and 3. Fig. 2 shows the ejector while it is filling. At the top of the ejector is an automatic-valve apparatus, controlled by a weighted lever. A rod connected with one end of this lever passes through a stuffing-box, and into the interior of the ejector. On this rod is a reversed cup or "bell," and connected with its lower end is a weight or "cup." While the ejector is filling, the valve marked 2 is held to its seat by the pressure from the rising main, and the valve marked 1 is lifted by the pressure of the inflowing sewage. The air within the ejector passes out through an exhaust port and pipe to the man-hole or sewer.

When the ejector is full, the "bell" is affected by the buoyancy of the water, and the weighted lever falls, closing the exhaust port; and immediately afterwards opening the inlet port, admitting compressed

*Shone, Pneumatic Sewerage System.

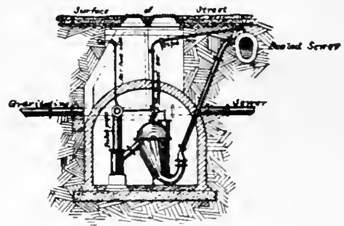
PLATE XI



SECTION ON AB
FIG. 2

SECTION OF EJECTOR STATION
FIG. 1

SECTION ON CD
FIG. 3



EJECTOR STATION
FIG. 4

DETAILS OF ISAAC SHONES PNEUMATIC SEWERAGE SYSTEM

DETAILS OF ISAAC SHONES PNEUMATIC SEWERAGE SYSTEM

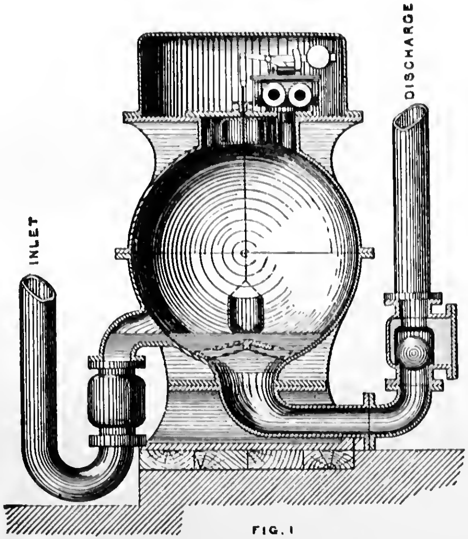


FIG. 1

SHONE'S PNEUMATIC EJECTOR

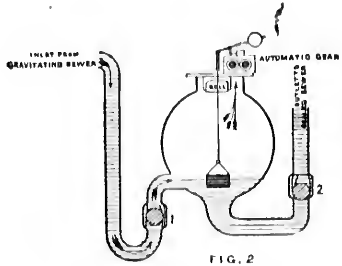


FIG. 2

FILLING

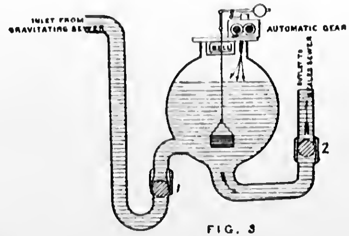


FIG. 3

DISCHARGING

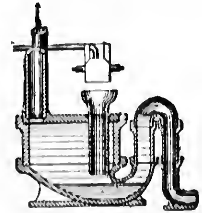


FIG. 4

SECTION

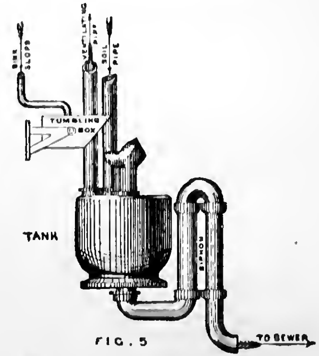


FIG. 5

SHONE'S HYDRAULIC SYPHON EJECTOR

air to the interior of the ejector. This acting upon the surface of the sewage causes the valve 1 (Fig. 3) to close and the valve 2 to open and permit the passage of the sewage to the pressure main in the street at a higher level, to which it is raised by the force of the compressed air. When the sewage has fallen to the bottom of the "cup" suspended from the valve mechanism, its buoyancy has been withdrawn, and the "cup" falls, and reverses the valves, closing the inlet port, and immediately afterwards opening the exhaust port, through which the compressed air within the ejector escapes by a pipe leading to the man-hole or to the sewer. The atmospheric pressure being restored within the ejector, the valve 2 closes, and it begins to refill with sewage.

From this description, it will be seen that the Shone system is essentially a method of pumping sewage in detail by means of small pneumatic pumping engines situated in different parts of the city, all of which are operated by power generated at a single station. The system may be applied to the entire sewerage of a city, or may be confined to special districts, according to circumstances.

The Shone system is particularly valuable in the sewerage of towns where fall sufficient to produce a proper velocity of flow cannot be obtained, and where it is impracticable to convey the sewage to one general pumping station, since, in this system, it is not necessary to follow the general topography; but the sewers may be given such grades as may best promote the rapid discharge of the sewage. An ejector may be placed wherever these grades cause the depth of the sewer to be excessive, and the sewage may be raised to a height from which it may flow to the outfall, either under pressure or by gravity. The cost of an equal number of small steam pumps, with their appurtenances, to do the work done by the ejectors, would be very great.

As a basis for comparing the cost of pumping all the sewage of a town at a single pumping station with the cost of pumping the same in detail by a number of Mr. Shone's ejectors, it has been estimated that,

"The efficiency of the compressed-air process, when used with Mr. Shone's ejector at a pressure of twenty-nine pounds per square inch, competent to lift sewage some sixty-seven feet, is somewhere between thirty and thirty-eight per cent of the power expended in compressing the air, the remainder, viz., from sixty-two to seventy per cent, being lost."* When working at lower pressure the loss is not so great. The pressure needed depends upon the height to which the sewage must be raised. "In using this system, therefore, it may

* Sanitary Enigneer, Vol. 4, 1881.

often be better to lift the sewage two or three times successively rather than to do it all at once. Such a course would involve a certain additional cost in multiplying the number of ejectors and in extending the pipes containing compressed air to the additional stations. The amount to be thus expended would, of course, depend entirely upon local circumstances."*

The ejector of Mr. Shone utilizes the power of the compressed air to the best advantage possible when expansion is not used, since the air operates directly upon the sewage without the intervention of a piston or any moving mechanism producing friction, except the valves controlling the flow of the sewage.

The sanitary defects, if any, existing in the Shone system, are those peculiar to the water-carriage system, and do not arise from its peculiar method of pumping. Its tendency is to remove these defects by insuring a rapid flow throughout the sewers. Moreover, when once the sewage has entered the ejectors, there is no longer any danger to be apprehended from sewer gases, as the sewage passes from the ejectors either into sealed pipes under pressure, or into gravity sewers of good declivity.

The Shone system was first brought to the attention of the public in 1878, by the inventor, in an address before the Sanitary Institute of Great Britain. It is in successful operation in several places in England.

THE WATER-CARRIAGE SYSTEM.

SEWAGE AND RAINFALL.

The water-carriage system, as the name implies, depends upon the transporting and cleansing properties of water for the removal of sewage. The system is the one that has been adopted for the greater number of sewerage works; indeed the word *sewerage* is sometimes defined as meaning a system of channels for the removal of sewage by this method.

This system is not restricted to the removal of any specific class of sewage, but is used for the removal of house sewage, the surface storm water, the subsoil water, and such liquid wastes from manufacturing establishments as it is proper to admit into sewers. It may,

* Sanitary Engineer, Vol. 4, 1881.

consequently, be adapted to a great variety of circumstances and conditions, which fact has led to its extensive use in this and other countries.

An efficient system of sewers should convey all the sewage away from inhabited districts before any decomposition has taken place in it. The sewers should be so ventilated that the gases contained in them shall have no access to the interiors of buildings.

The first condition is provided for in the water-carriage system by giving the sewers such an inclination that the sewage may flow with sufficient velocity to remove the solid matters suspended in it, and by giving them such transverse dimensions that the stream of sewage shall be concentrated, thereby economizing its scouring power and preventing the stranding of solids along their interior.

According to the experiments of Thos. E. Blackwell, C. E., on the effect of different velocities in removing solid bodies, made in 1857 for the Metropolitan Drainage Referees, "a velocity of from two feet to two and a half feet per second will remove all objects of the nature and dimensions of those that are likely to be found in sewers." A mean velocity of one yard, or one meter, per second is generally sufficient to prevent deposits in sewers.

The velocity of flow is dependent upon several conditions, the most important being the slope, or inclination of the surface of the liquid. This, except on very flat grades, is sensibly the same as the inclination of the bottom of the sewer itself.

Another condition affecting the velocity is the degree of concentration of the stream; the greater the concentration, the less will be the relative surface of contact between the sewage and the sewer, and, consequently, the frictional resistance.

Another condition that sometimes affects the velocity in the sewer is the velocity with which the sewage enters it. This initial velocity, under certain favorable circumstances, may continue in the sewer, and may accelerate the velocity of flow beyond the amount usually found in sewers of like size and inclination. Instances of high initial velocity are frequently found in the discharges from rain-water leaders, and from catch-basins if considerably above the sewer.

The accelerating effect of high initial velocities cannot, however, be depended upon. Wherever there is the least tendency to stoppage or to an interference of the various entering streams, either with themselves or with the main current, a retardation ensues which causes the sewer to become choked and to discharge, under pressure,

through the nearest available outlets; flooding cellars and, in extreme cases, overflowing upon the surface of the street.

Before determining the sizes of sewers, it is necessary to ascertain the volume of sewage that they will have to carry. In dealing with this element of the problem, a great diversity in practice has arisen, resulting in two distinct types of water-carriage sewerage, called respectively the "separate" and the "combined" systems. By the first, the house sewage and other waste liquids, with or without a limited portion of the storm water, are conveyed in one distinct system of sewers, the surface and subsoil waters being conveyed in other distinct systems. By the second, a single system of channels is provided for the conveyance of all matters.

The amount of sewage derived from the drainage of houses, public institutions, and manufacturing establishments may be taken as approximately equal to the water supply, the greater portion of which, after use, passes away through the sewers. It is important to remember, however, that this class of sewage is not discharged into the sewers at a uniform rate, but that its volume varies from hour to hour, and depends largely upon the domestic habits of the population. It was found in London that the maximum flow in the more fashionable districts of the west end occurred two or three hours later than in the districts at the east end occupied by the poorer classes.*

Careful observations upon the flow of the London sewers showed that if the day be divided into three periods of eight hours each, the amount of the maximum flow was during the eight hours between 9 A. M. and 5 P. M., and was equal to forty-nine per cent of the entire daily flow, while eighteen per cent only flowed during the eight hours of minimum flow, which occurred between 11 P. M. and 7 A. M.†

In estimating the maxmium quantity of sewage likely to enter the sewers at various parts of the metropolis, a liberal margin was taken beyond the results of actual measurements, and provision was made for one-half of the sewage to flow off within six hours.*

These rates have each been used in other instances as general guides in estimating the ordinary maximum flow of sewers.

When large volumes of subsoil water are constantly entering the sewers, the conditions become somewhat different and the flow becomes more uniform throughout the twenty-four hours.

The maximum daily flow of sewage is not an important factor in determining the sizes of sewers belonging to the combined system,

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* Bazalgette, The Main Drainage of London.

† Metropolitan Main Drainage Report, 1857.

their size depending upon the volume of storm water which they will have to carry. It is, however, an important factor in determining their shape, which should be such as will concentrate the small stream of ordinary sewage as much as is practicable.

In the sewers of the separate system, from which the storm water is excluded, the maximum daily flow becomes an important factor in determining the size.

Careful observations upon the hourly flow of the sewers of Memphis, Tenn., which is sewered upon the separate system, show it to be remarkably uniform. "Thus, from 6 A. M. till 1 A. M. the following morning, a period of twenty hours, the flow oscillated in centre depth from 12.5 to 14.5 inches; the minimum area of flow being 206.5 square inches, the maximum 245.73 square inches. From 1 A. M until 5 A. M., a period of four hours, the centre depth of flow varied from 8.5 inches to 11.5 inches; minimum area being 107.6 square inches, maximum area 186.9 square inches. Taking the twenty-four hours, the minimum flow is 43.7 per cent of the maximum; taking the twenty hours of greatest flow, the minimum is eighty four per cent of the maximum. Eight ninths of the daily flow of sewage passed in twenty hours; one ninth in four hours. This marked uniformity of flow during twenty hours of the day, and its oscillating character within such small limits, must be somewhat influenced by the action of the flush-tanks, which probably discharge in small groups." *

An example of the variations in the flow of sewers receiving subsoil water is given in the Fourth Annual Report of the Massachusetts State Board of Health, 1873. An examination of the ordinary flow of sewage in the sewers of Worcester, Mass., showed that, taking the twenty-four hours, the minimum daily flow varied from fifty per cent to eighty-nine per cent of the maximum daily flow, and "that the flow from 9 P. M. to 6 A. M. is about eight ninths of the flow from 9 A. M. to 6 P. M." †

The amount of storm water to be provided for depends upon several conditions, which vary so much in different localities that no general rules can be given for the calculation of the precise amount of storm water in any given place. These conditions are.—

1. The amount of rainfall in a given time, as one hour, and the duration of the rain.
2. The permeability of the surface of the ground.

* Latrobe, Baltimore Sewerage Report, 1881.

† For results of gaugings of Providence sewers, see Appendix C, original report.

3. The degree of saturation of the ground at the period of rain, the season of the year, and the amount of evaporation.
4. The character and inclination of the surface of the ground.

In observing the rainfall, great care should be exercised to ascertain the precise duration of the entire storm, also the duration of the heavy showers that frequently occur during storms, and the amount of rain falling at these several periods. This may be done most conveniently by an automatic self-recording rain-gauge, by means of which the rate of fall at any instant during a storm may be ascertained. Meteorological records should be used with great discrimination, in computing rates of rainfall. Unless the observations have been made for the express purpose of obtaining them, the rates of fall derived can seldom be depended upon. These records, as usually made, merely give the total amount of rain falling at certain times, and fail to distinguish, for example, between a fall of one inch within an hour, and another of one inch which is an hour in falling. Had the former occupied only twenty minutes, the rate of fall would have been three inches per hour.

If all the storm water is to be conveyed by the sewers, provision should be made for conveying such a quantity as is likely to be occasioned by severe storms, even if such storms occur at comparatively long intervals; for a system of sewers should at no time be the source of damage to property or health through failure to perform its functions. Should these conditions require excessive sizes and cost,—and they usually will,—no attempt should be made to convey the entire volume of the water of severe storms through the sewers, but portions should be allowed to flow over the surface of the streets, or should be conveyed by special channels.

The discharge of surface water from very large drainage areas presents a peculiarity which should be remembered when proportioning the sizes of the main out-fall sewers of very large districts: it is, that the parts of the district lying nearest the channel of discharge will have delivered a portion of storm water before other portions from the more distant parts will have had time to reach the channel by flowing over the surface of the ground. Under these circumstances, the channel of discharge may be made smaller than would be necessary were all parts of the district discharging into it simultaneously. There is an important limitation, however, to the application of this principle.

"When water falls in the shape of rain on any solid surface, whence afterwards flows off, it forms its own drainage vehicle. It produces

over that solid surface a certain depth of water with a certain superficial slope or fall toward an outlet; these two conditions, depth and surface slope, being necessary to produce flow. Should the solid surface be at all absorbent, the rain has to furnish the quantity of water necessary to saturate it. While the drainage vehicle is forming and having its capacity increased, the water is flowing off the surface less rapidly than it falls upon it, and, should the rain cease before it has completed its own drainage vehicle, the rate of discharge from the surface upon which it falls will never equal the rate at which the rain has fallen upon it. It is only when the time necessary for this preliminary operation of forming its own drainage vehicle has elapsed, that the water flows off from a surface as rapidly as it falls upon it. The time required increases with the linear distance between the upper and lower ends of the surface drained and with the gentleness of its fall."*

Assuming that the drainage vehicle has been sufficiently formed to produce a flow over the entire surface of a drainage district, a particle starting at the distant periphery of the district, will, in due time, arrive at the channel of discharge. Should the rain continue until this occurs, this particle from the periphery will have united with a series of other particles at successive points, and the entire elementary discharge will be equivalent to a simultaneous discharge into the channel from all points of the path of flow. The conditions being the same for other paths, the total discharge of the drainage district will be equivalent to the simultaneous discharge from all its parts, whenever the rain continues (after having formed the drainage vehicle), until a particle fróm the farthest point of the periphery shall have reached the channel of discharge. This tendency to flood will continue until the rain ceases.

Where the drainage district is small and the surface comparatively impervious, the time required to form the drainage vehicle is very short. Where the communication between the periphery of the district and the main outfall channel is direct and the flow rapid, the time required for a particle to traverse the distance will also be short.

These conditions exist pre-eminently in city drainage areas. Consequently the duration of ordinary storms very frequently exceeds the time required to establish the conditions producing floods in the sewers of cities, particularly in districts that are thoroughly sewered, and in which the storm water is admitted to the sewers near the periphery of the district.

* O'Connell, Flood Discharge of Rivers, Proc. Inst. C. E., Vol. 27.

In very large districts comprising a large proportion of suburban area covered with gardens and lawns, where the storm water has to flow over the surface for considerable distances before reaching the sewers, the duration of storms may seldom be sufficient to establish the conditions of flood, and the discharge of the storm water from contiguous zones of such drainage districts may usually be considered as consecutive; but in urban districts comprising paved streets and yards, where the storm water is led directly to the sewers, the discharge will often be simultaneous from all parts of the drainage district.

The principle of reducing the sizes of main sewers on account of the successive discharge of storm water from contiguous zones of the drainage district should, therefore, be very cautiously applied.

* * * * * * * *

Owing to the indeterminate nature of the problem, it has become customary to assume that one half the volume of a given rainfall will reach the sewers during the time of fall. For example, it is customary to assume that the volume discharged into the sewers from a rainfall of one inch per hour will be equivalent to a depth of half an inch per hour over the entire area of small drainage districts. This is equivalent to a discharge of 30.25 cubic feet per minute per acre, or 0.5042 cubic feet per second per acre.

* * * * * * * *

The probable amount of storm water to be provided for in the construction of a system of sewers cannot at present be estimated with exactness; such an estimate must depend largely upon experience and judgment, and existing formulas must be considered merely as aids to correct judgment, and not as possessing mathematical exactness.

The amount of sewage to be removed at different parts of the drainage district having been determined, the sizes of the sewers may be computed by means of any reliable hydraulic formula, of which the one known as "Kutter's formula" is at present considered to be best adapted to the solution of problems connected with the sewerage of cities, and is the one now in use in this city.

The sizes of sewers are often dependent upon financial instead of meteorological conditions. When, for instance, the sewage has to be pumped from the low lying districts to a higher elevation before it can flow to the outfall, the expense of establishing and maintaining sufficient pumping capacity, in excess of the ordinary amount, to remove the water from severe storms, becomes enormous, and, together with the excessive cost of constructing sewers of sufficient size, renders

the scheme impracticable. In such cases it is usual to convey to the pumping station only a portion of the storm water, the remainder either flowing over the surface of the streets, or, if admitted into the subsidiary sewers, being excluded from the main sewer leading to the pumping station, and allowed to pass into other channels through overflow weirs.

At London, where this arrangement is adopted, storm water only to the amount of one quarter inch in depth per twenty-four hours from urban territory, and one eighth inch in depth per twenty-four hours from outlying suburban territory, nearly equivalent to 0.01 and 0.005 of an inch per hour respectively, is carried to the outfall, in addition to the ordinary daily sewage, during the six hours of maximum daily flow. Greater rainfalls than this frequently occur in London, and overflows have been provided, through which an excess of water may pass into the Thames.

The new sewerage works at Boston, Mass., are designed to convey 0.01 of an inch of rain-water per hour to the outfall, in addition to the daily sewage, when flowing about half full, and numerous overflows have been provided by which surplus water can pass directly into the harbor though the old outlets.*

The following table, compiled from Mr. Hering's report on European sewerage works, shows in a general way the extent to which storm water has been provided for in the sewers of some of the more important European cities. It indicates the great diversity caused by various local conditions.

* Clarke, Main Drainage Works at Boston.

PLACE.	Maximum rainfall known.	Maximum rainfall recognized.	Proportion supposed to enter sewers.	Rainfall provided for in sewers.	REMARKS.
	Inches per hour.	Inches per hour.		Inches per hour.	
Paris.......	4.8	1.77	⅓	0.590 •	All sewers are large enough for men to walk upright in them. The rainfall is only considered when the grades are small.
Berlin......	2.3	⅞	⅓	0.292	
Vienna.....	1.0	1.+	About ⅜	0.375	All sewers are large enough to be entered. The estimated storm flow when used to determine size only fills the sewers to the springing line of the arch.
Hamburg...	1.1	$\frac{1}{24}$	⅔	0.028	All ordinary sewers are large enough to be walked through. The storm flow is mainly considered in connection with the intercepting sewers. Numerous overflows are provided.
Frankfort..	1.2	$\frac{1}{48}$	All	2.021	For the intercepting sewers only.
Frankfort...	1.2	¼	All	0.250	For certain overflow sewers.
Dantzic....		$\frac{1}{24}$	All	0.042	Numerous overflows are provided.
Brighton....	0.7	½	All	0.500	

* * * * * * * *

The relation between the storm flow of sewers and their ordinary daily flow is necessarily very variable.

The drainage of the subsoil water is usually effected by sewers in an indirect manner. Occasionally, when the volume of subsoil water is very great, separate lines of agricultural drain-pipes are laid beneath or beside the sewers. They may discharge the subsoil water into the sewers at convenient points, or may lead it to other channels.

Frequently, no special provision is required for the disposal of the subsoil water. The mere opening of sewer trenches exerts a powerful influence towards the drainage of retentive soils, by breaking up the strata and natural lines of underground flow, and presenting new channels for the flow of subsoil water through the earth which is refilled into the trenches, which is seldom as compact as it was originally. Although sewers are expected to be water-tight, and are carefully constructed with that object in view, there exist, nevertheless, in the best constructed sewers, some points where the subsoil water may enter them, either through the porous substance of the sewers themselves or at certain joints.

This, although undoubtedly a defect, has been found to cause no serious pollution of the soil from the percolation of sewage. The ground water is seldom removed so completely as to permit this reverse percolation. Usually it remains at a somewhat higher level than the ordinary line of flow in the sewer, and controls the direcrion of the percolation by its superior pressure.

* * * * * * * *

"By digging underneath well-built sewers, Dr. Wolfhügel showed experimentally to a large number of experts that the soil was not appreciably affected by the sewage."

THE SHAPE AND SIZE OF SEWERS.

The correctness of the principles given in the previous section as governing the self-cleansing action of sewers has been abundantly proved by numerous examples from the practice of former days.

One does not need to search far among the works built according to the principles in vogue in this country twenty-five or thirty years ago, to find examples of sewers constructed of stones or bricks laid without mortar or in common lime, through whose open or imperfectly filled joints the sewage water escaped into the surrounding earth, filling it with pollution, leaving the solid matters to accumulate in the sewers, from the want of sufficient liquid to carry them to the outfall. Neither is it difficult to find examples of sewers whose dimensions were so excessive, compared with the quantity of sewage to be conveyed, that the ordinary stream of sewage was spread over broad surfaces, its scouring power being expended in forcing a tortuous passage through deposits and among obstructions.

In those days, a self-cleansing sewer was rare indeed. Deposits were expected in sewers. and their sizes were made such that they could be entered and cleaned by manual labor whenever occasion required.

It was felt in England, at an earlier period than in this country, that such methods must be radically wrong, since the sewers failed to accomplish the purpose for which they were built, and acted as reservoirs for the retention of filth, instead of channels for its speedy removal.

This subject was very fully examined by the Metropolitan Sanitary Commission, and their first report, made in 1847, contains many examples of the inefficiency of prevailing methods of sewer construction, as well as suggestions foreshadowing methods now in use.

Mr. John Phillips, C. E., chief surveyor to the Westminster Court of Sewers, stated in his evidence before this commission :—

"I had observed, in passing through them (the sewers), that a large number of them had a tendency to choke up, inasmuch as not only was the flatness of the bottom unfavorable to the free flow, but there was the escape of drainage from passing through the open joints of the bottoms."

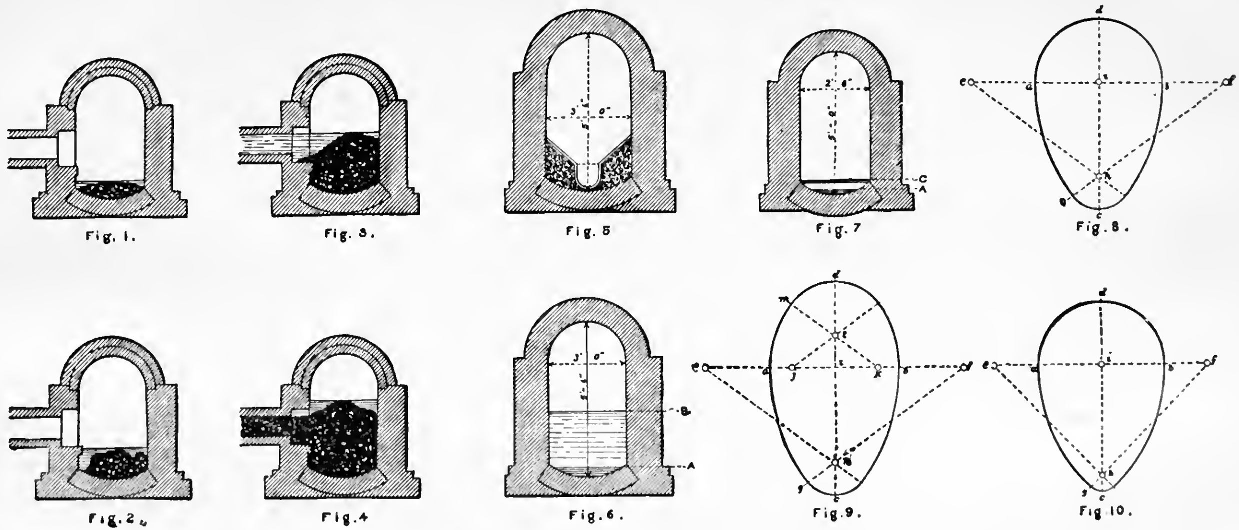
This statement was accompanied by several sectional sketches showing the sewer, the house drain, and several typical forms of deposits as observed in the sewers. These are shown on Plate XIII, Figs. 1, 2, 3, and 4.

Concerning the means of correcting this tendency of the sewers to become choked with deposits, Mr. Phillips testified :—

"I take my data from practical experience and observation rather than from theory or calculation. In passing through the sewers, I have observed that the currents of water running through very many of the branch and collateral sewers were mere dribbles, and that, from being diffused over a large, flat surface, they were not of sufficient strength to remove the soil. Looking at these currents and comparing them with the extraordinary sizes of the sewers (Plate XIII, Figs. 6 and 7), I should say such currents might be passed through pipes varying from three to nine inches in diameter. In a large number of the sewers, the currents have cut narrow and deep channels through the soil (Plate XIII, Fig. 2), and by so doing, it appeared to me that nature was endeavoring to correct the faults of art. I think it would be desirable to take a lesson from nature in this respect, and form the bottoms of all the sewers which have a tendency to choke up in accordance with the following sketch (Plate XIII, Fig. 5). It has sometimes been the practice to cut similar channels through the soil for the drainage to run through, and they have acted for a time very well indeed, so well as to give me entire confidence in the working of narrow and reduced sizes of sewers. I propose to bed channel-tiles of various diameters along the bottoms of the sewers, and fill in behind them with concrete. I am satisfied that . . . most of the sewers would keep themselves clean by this means."

The transition from this modified form for the improvement of faulty existing sewers, to an egg-shaped section, for the construction of new sewers, was both easy and natural. Three forms of egg-shaped sewers, designed by Mr. John Phillips, are shown on Plate XIII, Figs. 8, 9, and 10. The form shown in Fig. 8 has been very extensively

PLATE XIII



A. LEVEL OF ORDINARY FLOW
B. " " FLOW IN GREATEST THUNDER STORM
C. " " " DURING GREATEST STORMS

SECTIONS OF LONDON SEWERS

used, and is the form adopted for many of the Providence sewers. Fig. 9 is given in the report above referred to. The lower part is the same as in Fig. 8, but the upper part is modified to give more height for a given width. Fig. 10 is a more recent design. Mr. Baldwin Latham writes concerning it:* "The new form (Fig. 10) is stronger than the old form (Fig. 8), and, under certain conditions of small volumes of flow, it is better adapted to be a self-cleansing sewer than the old form of oval sewer. . . . In the new form, as a given volume of sewage will fill the sewer to a greater vertical height than in the old form, it is consequently found that, with moderate quantities of sewage flowing in the sewers, there is a greater surface fall and velocity of flow in the new form than in the old form of sewer." Another design, composed of the upper portion of Fig. 9 combined with the lower portion of Fig. 10, was used by Mr. Latham in a tunnel sewer under the town of Longton.

The proportions used in drawing these forms for egg-shaped sewers are given in the following table :—

THE DIMENSIONS OF EGG-SHAPED SEWERS IN TERMS OF THE TRANSVERSE DIAMETER, A. B.

Line.	Figure 8.	Figure 9.	Figure 10.
c d	$1\frac{1}{2}$	$1\frac{2}{3}$	$1\frac{1}{2}$
c h	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{8}$
a f	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{8}$
c i	1	1	1
i d	$\frac{1}{2}$	$\frac{2}{3}$	$\frac{1}{2}$
i l	. . . .	$\frac{1}{4}$	. . . .
a j	. . . .	$\frac{1}{6}$	. . . .
k m	. . . .	$\frac{5}{6}$	. . . .
l m	. . . .	$\frac{5}{12}$	. . . .

Egg-shaped sewers are adapted to cases where great variations occur in the volume of sewage. The bottom of the sewer, being sharply curved, concentrates the stream of dry weather sewage, thereby preserving its scouring power and rendering the sewer self-cleansing during the dry weather, if its size has been properly adapted to the local conditions. The upper part of the sewer, being of greater size, furnishes capacity for large quantities of storm water.

When the volume of sewage is more uniform, the circular form is

* Sanitary Engineering, p. 180.

better adapted to the conditions of flow. Of all plane figures enclosing the same area, the circle has the shortest periphery. A sewer flowing constantly full should therefore be circular, since it then presents the least amount of frictional surface. The proportion between the area and periphery of a semi-circle being the same as for the full circle, it follows that sewers which are to flow constantly half full should be circular. The circular form is also the strongest and cheapest to build.

When the conditions of flow in sewers are such that the ordinary flow is considerable in volume, while the storm flow is so controlled that it is not more than double the ordinary flow the circular form should be adopted. These conditions frequently exist in the main lines of sewerage. Intercepting and outfall sewers are consequently made of circular form in numerous instances.

The smaller sizes of sewers can be made more cheaply and satisfactorily with pipes than with bricks. Glazed pipes present very little frictional resistance to the flow. A proper scouring velocity can, consequently, be obtained with an inferior concentration of the stream. It is, therefore, customary to use the circular form for small sewers of glazed pipes.

The size at which the cost remains the same whether pipes or bricks are used depends upon the relative cost of materials and labor, but this economic limit is usually found in sewers of sixteen or eighteen inches in diameter. It may therefore be said, in a general way, that sewers less than sixteen or eighteen inches in diameter are usually made of circular, glazed pipes, and that sewers greater than sixteen or eighteen inches in diameter are usually made of brick, and egg-shaped, except intercepting and outfall sewers, which are frequently made circular.

Other forms are sometimes required where sufficient depth is wanting to construct egg-shaped and circular sewers. These forms should be adapted to the local requirements, and to the peculiar conditions of earth pressure existing at the places where they are to be built.

The sizes and forms of the sewers of some European cities have been based upon principles different from those governing the proportions of self-cleansing sewers. The sewers of Paris, for example, are noted for their enormous size and completeness of construction. The French engineers assumed that it would be necessary to remove deposits from all their sewers by manual labor, that they must consequently be of sufficient size to be entered, and that a true regard for

economy would require that their sizes should be such that men could work in them without being cramped for want of room.

These sewers are intended to receive the surface water from the streets,— that coming from storms as well as that used in the daily washings of the streets,—the overflow from cesspools and the sink water. No solid fæcal matter was allowed to enter them until recently. It is now permitted to enter certain sewers in which the current is sufficient to prevent deposits. The openings in the gutters are connected directly with the sewers without any intervening catch-basin or trap. All the street detritus thus passes into the sewers, from which it is removed with great labor and expense, by workmen who are constantly employed for this purpose.

Some of the forms of the Paris sewers are shown on Plate XIV.* That adopted for the larger sewers recalls the design suggested in 1847, by Mr. Phillips, Plate XIII, Fig. 5. The lower channel or *cunette* is for the ordinary stream of sewage. The upper portion, made large for the convenience of the workmen, provides capacity for excessive storms. They are provided with a footpath (*banquette*) upon each side. Some of them have a railway track, upon which the workmen run small wagons containing tools and other apparatus; others are navigated by boats. Water pipes are laid in the upper portions of these sewers, for convenience of access, and to avoid opening the streets during repairs.

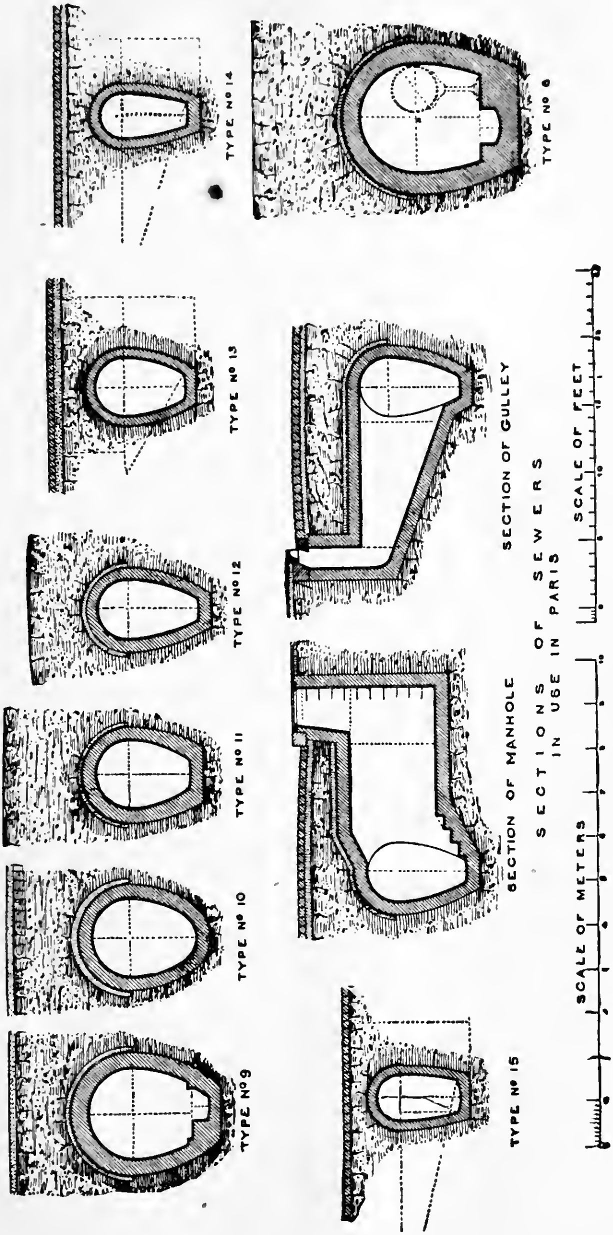
The cleaning of the large sewers is done by travelling dams. These are formed so as to fit the lower channel (*cunette*) of the sewer. They are attached to the boats and wagons by mechanical appliances, by which they may be lowered to any required position. The boat being placed at the up-stream end of the section to be cleaned, the dam (*vanne*) is lowered until its lower edge enters the deposits in the sewer. The sewage thereupon rises back of the dam, creating a pressure which forces a strong current beneath the dam, loosening the deposits. The pressure also moves the boat and dam forward until the resistance of the accumulated deposits becomes too great, when a new start is made.

THE VENTILATION OF SEWERS.

The importance of perfect ventilation in sewers is second only to the need for the rapid and complete removal of all putrescible matters. It is not necessary to enter into any extended argument to

* Proc. Inst. C. E., Vol. 53.

PLATE XIV


TYPE No 14
TYPE No 6
TYPE No 13
SECTION OF GULLEY
TYPE No 12
TYPE No 11
SECTION OF MANHOLE
TYPE No 10
TYPE No 9
TYPE No 15
SECTIONS OF SEWERS
IN USE IN PARIS
SCALE OF METERS
SCALE OF FEET

prove the deleterious nature of the gaseous products of decomposition usually found in sewers, and commonly termed sewer gas. It is universally admitted that, when of sufficient strength, these gases may produce debility, loss of appetite, headache and nervous prostration, and may render the system susceptible to the attacks of disease. It is also very generally admitted that they may become the vehicle for conveying the germs of certain contagious diseases, as diphtheria, typhoid fever, scarlet fever, etc. By the processes of ventilation, these gases become diluted with atmospheric air, which greatly modifies their dangerous character.

Thorough ventilation is also necessary to prevent the gases in the sewers from being compressed by any sudden increase in the volume of sewage, as occurs during sudden storms, and whenever the outlets of the sewers are tide-locked, or by the effect of a sudden rise of the temperature within the sewer, which may be caused by the admission of hot water or steam. A very slight degree of pressure is sufficient to overcome the resistance offered by water-seal traps, which are the usual defence against the entrance of sewer gases into our dwellings. Thus, for example, a pressure of a little more than one ounce per square inch may be sufficient to force a running trap having a water-seal one and one half inches in depth. For this reason, among others, the admission of hot water and steam into sewers should be prohibited. Internal pressure may sometimes be produced by strong winds blowing into the outlets of the sewers. This should be prevented by suitable construction.

But, important as the ventilation of sewers is, from sanitary considerations, no method has yet been found which has given entire satisfaction, nor which is applicable to large cities as a whole. The most general solution of this question is to provide an ample supply of water to cleanse the sewers and to remove all putrescible substances, thereby preventing the formation of noxious gases, and to provide frequent and ample openings to admit fresh air and promote circulation.

The subject of sewer ventilation has received the attention of sanitarians for very many years, and there has been no lack of suggestion of methods, nor of trial of such as seemed most feasible. The difficulties connected with its solution are inherent to the question itself.

Mr. W. Haywood, engineer of the London City Commissioners of Sewers, testified in 1858 :* "I have examined the question with the

* Report of Select Committee on the State of the River Thames, 1858.

greatest care, and, although I am compelled to state that the present system is very far from a perfect one, yet every proposition for improving the ventilation is met with hosts of difficulties which really look insignificant until you investigate them, when they become so formidable that you may call them invincible."

The motion of the air in sewers is dependent upon conditions which are constantly varying. At times, it is controlled by the friction of the stream of sewage, which may produce a current of air flowing in the same direction. At other times, it is dependent upon the relative densities of the air within and without the sewer. This may cause the sewer air to rise to the more elevated districts, or the reverse, producing much annoyance from foul odors. Again, the motion of the air may be affected at different points in the same sewer by a variety of conflicting influences, producing counter currents and eddies. Where it is customary to leave the house drains untrapped, and to extend them above the roofs with open ends, thus acting as ventilators to the sewers, the temperature of the air within the house drains and soil pipes, which is dependent upon the temperature of the houses, may become the controlling element governing the direction of the currents in the sewers, and may produce outward or inward currents at the house connections according to the relative temperatures of the air in the houses and in the sewers.*

The direction and velocity of the currents of air in sewers being so variable, the means employed for ventilation must be either sufficiently varied in their character to meet the diverse requirements, or sufficiently energetic to be themselves, at all times, the element governing the direction of the motion of the air throughout the entire system of sewers.

The ventilation of mines is usually accomplished by means of furnaces, which produce sufficient draught to remove the necessary amount of air, and it has been frequently urged that a similar method might be used in the ventilation of sewers.

It was thought that an efficient ventilation of sewers could be effected by means of high chimneys, especially erected for the purpose or already existing in certain manufacturing establishments; the draught being produced by furnaces through which the sewer gases should pass and be consumed. This question has received great attention in England.

Mr. W. Haywood testified as follows as to the practicability of ven-

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* Soyka, Munich Experiments, 1882.

tilating sewers by means of furnaces, before the Select Committee on the State of the River Thames:—*

"My impression is, that there will be exceeding difficulty in doing it at all; but, if it can be done, it will only be at an enormous annual expense. The difficulties to be overcome are gigantic. . . . The difference between a mine and a sewer is an essential difference; a mine . . . has but one inlet and one outlet for the purposes of ventilation; a sewer has thousands and tens of thousands. . . . All these openings are continually varying in their condition, and you must bear in mind that, supposing . . . the whole district has been so arranged as to have a sufficient exhaustive power, the mere opening of a water-closet, or the enlarging or putting in of a new drain into a sewer, or the making a hole a foot square, . . . or a sewer man lifting a side-entrance covering, would very much destroy the power of the furnaces; and, unless you had a gigantic power sufficient to guard against all these casualties, the system could only be a failure."

Sir J. W. Bazalgette, testifying before the same committee, said:—

"It is impossible so to arrange the sewers themselves as channels in mines are arranged with a view to ventilation, it being impossible so to trap the inlets to the sewers as to admit of a flow of sewage into them, and at the same time to prevent the passage of air from the nearest inlets to the furnaces. A furnace ventilating any large district would require to produce a very large volume of air, and to keep up a velocity sufficient to ventilate all the branch sewers, and the drag would consequently be so great through the main that it would force open any house-drain traps or water traps we could form, before it would influence the remotest branches; but, putting those difficulties out of the question,—which appeared to us insuperable,—we found that the consumption of coal to extract the required quantity of air—supposing that the sewers could be laid out like the channels of mines—would be something enormous."

At the time of the sessions of this committee, the furnace of the clock-tower of the Houses of Parliament, which formed a part of the system of ventilating those buildings, had been connected with the sewers in the vicinity, and experiments were made to ascertain its efficiency in ventilating them.

These experiments showed that its influence was inappreciable except in its immediate vicinity, and the committee, in their report to the House Commons, said:—

* Report of Select Committee on the State of the River Thames, 1858.

"This furnace system, therefore, even with the improvements introduced by Mr. Gurney, though possibly efficacious for a particular and limited area, could not be relied upon for the general ventilation and purification of the sewers of the metropolis at large."

Aside from questions of efficiency, the ventilation of sewers by means of furnaces is not void of danger. During the above-mentioned experiments, a portion of the sewers was found to contain quantities of coal gas, which had entered them from some leakage of the street gas pipes. An examination showed that these sewers had been isolated from the furnace by a flap valve which had not been raised. Upon raising it, an explosion took place at the furnace which caused considerable alarm. Another instance of an explosion is recorded, which occurred at a soap factory in London, whose furnace had been connected with the sewers for ventilation. This explosion was of sufficient force to destroy the establishment.

Other means for ventilating sewers by the production of an artificial draught have been tried, but have not proved successful. Drs. Parkes and Sanderson reported in 1871, concerning the efficiency of Archimedean screw ventilators at Liverpool.* After showing by experiment that the Archimedean screw ventilators really do the work which they profess to do, *i. e.*, that they actually remove a large quantity of air from the sewers, they conclude that, notwithstanding their mechanical efficiency, they exercise no practical influence in preventing the escape of sewer air into the streets and houses, for the reason that their size is out of proportion to the work they are supposed to perform. The diameter of the ventilators being under eight inches and that of the sewers being equal to that of a circle three feet in diameter, the sectional area of the sewer is about twenty times as great as that of the ventilators. Under such conditions, the movement, in the sewer, of air towards the ventilator, in either direction, "would be so small that, excepting in the immediate neighborhood of the outlet, it could not be measured by the most delicate instrument."

The conditions which render ventilation by means of furnaces impracticable, namely, the great volume of air to be removed and the existence of innumerable inlets, act in a similar manner when other sources of motive-power are adopted for creating a draught, and, in in the instance of Archimedean screw ventilators, necessitate that these screws should be very numerous as well as that they should be

* Report on the Sanitary Condition of Liverpool, 1871.

properly proportioned to the work to be done. Even with the most favorable arrangement, there is a liability that neutral points may exist midway between certain groups of ventilators acting in opposite directions.

Sir J. W. Bazalgette, reporting to the Metropolitan Board of Works in 1866, said:—*

"I entered carefully into the comparative advantages of ventilating fans and furnaces and into the expenditure of fuel requisite for the extraction of a given quantity of air under various conditions." After stating the reasons why such processes could not be successful in ventilating sewers, except at an enormous cost, he remarks, as to their relative efficiency, that "Steam jets, fans, and other mechanical contrivances worked by steam power do not affect the ventilation as satisfactorily as furnaces with the same expenditure."

Numerous other expedients for ventilating sewers have been tried at various places with different degrees of success depending upon local circumstances. Of these may be mentioned: (1) ventilation by means of perforated covers or man-holes and ventilators in the centre of the street; (2) by means of pipes to convey the sewer air to the street lamps, where the gases may be consumed; (3) by means of pipes leading to special flues constructed in houses, within the body of the walls, or near the chimney, or upon the outside of the house and running up above all windows; (4) by means of the house drains, which are then left untrapped and extended above the roof; (5) by deodorizing the exhalations with charcoal and various chemical re agents; and (6) by breaking the grade of sewers into steps upon steep inclines, thereby modifying the tendency of the gases to flow towards the extremities of the sewer.

Of the first of these methods, it may be said, that it is the most usual method adopted in this country. When the man-holes and ventilating shafts are sufficiently numerous, and the holes in the covers are so large that they do not become stopped with street detritus, this method has given fair results, provided the sewers are kept reasonably clean. It is often inoperative in winter when the snow in the streets has a considerable depth. This is certainly a serious defect, and should be guarded against by other provisions, as there is a greater liability for sewer gases to enter dwellings in winter, since the high temperature then maintained in houses is equivalent to a certain reduction of pressure on the house side of traps, and, to that extent, favors the breakage of their seal.

* Report of the Metropolitan Board of Works for 1865-6, p. 83.

As the inlets to the catch-basins are likely to be kept free from snow, such of them as can be left untrapped without causing offence may be left in that condition to serve for ventilation when the openings in the centre of the street are covered with snow. John Simon, medical officer to the Privy Council and Local Government Board, wrote concerning the ordinary conditions of self-cleansing sewers provided with free communication with the air:* "A sewer in which these conditions are fulfilled will scarcely, if at all, under ordinary circumstances, cause appreciable odor at open (untrapped) gullies in the street; the air in it, if at times compressed, will not easily exert at the duly guarded inlets of house drains any such pressure as can make way for it into houses, and, in cases where accidental defects of house drains unfortunately permit sewer air to enter houses, the sewer air will be at its lowest degree of dangerousness. It is a great security for such perfect ventilation of sewers as is essential to the safety of houses, that in addition to whatever special ventilating shafts are provided, street gullies should, as far as practicable, be left untrapped, and complaint of nuisance from any such gullies should not necessarily be taken as reason for trapping them." Such nuisance may be due to the foul state of the sewer, and its cause may be removed by proper cleansing. This method also has the advantage of being comparatively cheap and simple.

The method of ventilation by the use of street lamps has not proved a success.

The methods of ventilation by special flues, chimneys, external pipes, in and upon houses, and by the house drains, although said to be used with success in some places where a rigid inspection can be enforced, cannot be recommended for use in this country. The danger of leakage of sewer gas into houses from imperfect work, from the cracking and opening of joints caused by the settlement of buildings, from damage to the pipes and flues during repairs, etc., is too great to warrant the employment of these methods.

The experience of several of the large cities of Europe in the matter of sewer ventilation has been very extensive. The case of London may be taken as an example representing, in the main, the general results obtained. In 1876, the Metropolitan Board of Works, of London, published a report reviewing the experience and conclusions of that Board, concerning this subject, during twenty years.†

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* Second Report, New Series, M. O. P. C., Introduction.

† Annual Report of the Metropolitan Board of Works for 1876, App. 3.

Amongst other things, the Board, in 1868, appointed a special committee to consider the question of the ventilation of sewers, with a view specially as to the desirability of offering a premium for the best practicable plan for preventing the escape of injurious gases from sewers, and, at the same time, of preserving the safety of those who work in them.

After four years of experiment and deliberation, this committee reported "that it was undesirable to offer a premium, as it appeared from their investigations that no one plan of ventilation, however well adapted to succeed locally, would be applicable to the whole of the metropolis." The Board adopted and confirmed this decision of the committee.

The result and conclusions of the Metropolitan Board of Works concerning the ventilation of sewers are given in the report above mentioned, in a classified form as follows :—

"*A. General Conclusions.*"

"1. That some provision for the ventilation of sewers is absolutely necessary, both for the safety of the men engaged upon cleansing, repairing, and other necessary works in the sewers, and for the stability of the sewers themselves in the event of an explosion."

"2. That the method of ventilation adopted in mines where there are only two openings to be dealt with (an inlet for the air at one end, and an outlet for it at the other) is inapplicable to sewers."

"3. That the most efficacious and widely applicable mode of preventing the escape of offensive effluvia from the sewers is to provide them with such a copious supply of water that the decomposing matter within them shall be diluted and removed before any noxious gases have been generated."

"4. That ventilation by air-shafts from the sewers into the centers of the streets is a great improvement upon the old system of ventilation through the gully gratings at the sides of the streets."

"5. That it is inexpedient to incur a large expenditure for the purpose of making experiments to determine the value of the plan of ventilating sewers by means of furnaces."

"6. That it is unadvisable to offer a premium by public advertisement for the best practicable plan for the ventilation of sewers, inasmuch as no one plan, however well adapted to succeed locally, would be applicable to the whole of the metropolis.

"7. That a reward of 40 shillings [$10] be paid to any person giving such information to the Board as shall insure the conviction of any person or persons turning steam, or fumes and drainings from chemical or other factories, or any other deleterious substances contrary to law, into the sewers belonging to the Board."

"*B. Methods of Ventilation that have been tried in different localities with a variable amount of success.*"

"1. That the method of ventilating sewers by means of shafts or tubes placed at each end of the street and carried above the summits of the houses has been favorably reported on by the engineer."

"2. That the connection of sewers with rain-water or other pipes carried to the tops of the houses has been adopted with some degree of success, but is not capable of general adoption in consequence of the liability of the gas to descend into the chimneys and windows of such houses, and also in consequence of the great objection raised by most owners of property to such an arrangement."

"3. That the plan of ventilating sewers by means of air-flues connected with the furnaces and shafts of factories, and other buildings, considerably improves the ventilation of the sewers, in the immediate vicinity, but, in consequence of the great number of openings in the sewers of the metropolis, it is questionable whether a large portion of the noxious gases evolved is actually consumed by this method."

"4. That charcoal ventilating grates may be advantageously employed for deodorizing the gas issuing from such air-shafts as are sources of annoyance and complaint; but, inasmuch as their use tends to retard the effective ventilation of sewers, such ventilating grates should be cautiously and not generally applied."

"5. That the plan of deodorizing effluvia from sewers by means of sulphurous acid has been attended with partial success, but the benefit of the acid was in some cases neutralized by contact with steam and naphtha vapors."

"6. That the nuisance caused by the escape of the noxious effluvia from the ventilating shafts of sewers may in some cases be remedied by subjecting such effluvia to the action of chlorine gas, by means of an apparatus for that purpose being fixed in the shafts."

"7. That in a case where a sewer had been ventilated through a chimney shaft, and the furnaces connected with the shaft had been discontinued, it was not advisable to provide gas jets in lieu of them."

"8. That the nuisance arising from ventilating gratings can be temporarily remedied by covering such gratings with iron plates, to be removed only when the workmen are engaged in the sewer."

"9. That the various expedients of intercepting valves, flexible screens, and the like have in some places been employed with advantage to regulate the ventilation of sewers."

"*C. Various Schemes that have from time to time been submitted to the Board with reference to the Ventilation of Sewers.*"

"1. That the attempt to carry out the ventilation of sewers by means of a water fan would prove a failure."

"2. That the division of sewers into sections by means of valves, and the connection of each section with a furnace, are not generally applicable."

"3. That the plan of ventilating sewers by means of a pipe attached to the street gas lamps, and also the plan of using sulphur lamps to arrest the putrefaction of matter in sewers, are both inapplicable."

"4. That the construction of two fans at Crossness for the purpose of drawing the foul air from the sewers is impracticable."

"5. That the plan of ventilation by the connection of house drains with pipes constructed in the party walls and carried into the chimneys is not generally applicable."

"6. That the plan of purifying sewers by drawing smoke into them is not of a practical character."

"7. That the plan of cleansing sewers by means of travelling scoops is inapplicable."

"8. That the results obtained by the patent ventilator tried by the Board did not present any marked difference from those of the ordinary ventilator."

"9. That the prevention of the escape of foul gas from sewers by pouring some fluid preparation into the drains is impracticable."

THE SEPARATE SYSTEM.

The principle of conveying the storm water and the sewage proper by separate and distinct channels has been urged for more than forty years.

As has been stated already, the earlier types of sewers were built for the conveyance of surface water and the drainage of the land.

The admission of fæcal matter into them was an after-consideration, and followed the introduction of water-closets and public water-supplies.

With a largely increased volume of fluids to be removed, it was natural that existing channels should be utilized as far as practicable, and the precedent of using a single system of sewers for the conveyance of all matters became established.

The frequent stoppages and accumulations of filth in sewers of the primitive types led to prolonged discussions of the fundamental principles of water carriage. The conveyance of sewage in a distinct system of sewers is believed to have been first suggested as early as 1842 by Mr. Edwin Chadwick.

In 1846–7, Messrs. Roe and Phillips urged the adoption of pipe sewers for the sewerage of towns, instead of the enormous sizes then in vogue, and in 1847 the latter matured a project for the exclusion of storm water from the sewage. In 1849, Mr. Phillips proposed the separate system for adoption in the drainage of London, but the authorities were not then willing to introduce so radical a change. During the two following years the separate system was adopted in Alnwick and Tottenham, which are believed to be the earliest examples of sewerage works in which the surface water and subsoil drainage were separated from the sewage.

In 1852, the General Board of Health published a blue book officially advising the use of small pipes for sewers. This was followed by a long and bitter controversy upon the subject of brick *vs.* pipe sewers, in professional circles, in which the most extreme ground was taken on both sides. The small-pipe system was constructed in quite a number of towns in England with various degrees of success, and several towns adopted the principle of excluding the surface water from the sewers.

The separate system has been in use in this country for quite a number of years. It has been adopted by some fifteen or twenty towns in the United States, among which may be mentioned the city of Memphis, Tenn., sewered by Col. Geo. E. Waring, Jr., C. E., in 1879; Pullman, Ill., sewered by Mr. Benezette Williams, C. E., in 1880; and Nahant, Mass., sewered by Mr. Ernest W. Bowditch, C. E., in 1883. It is also being tried experimentally in a limited section of Paris.

The separate system contemplates the removal of house sewage and liquid manufacturing wastes through an independent system of pipes whose dimensions are proportioned to the volume of sewage passing

through them. It is essentially a system for the removal of *filth* by water carriage, the water being limited to the smallest necessary quantity.

The amount of sewage conveyed by such a system of sewers is consequently very uniform. With it, when properly constructed, there are no accumulations of deposits in the sewers, generating noxious gases and only to be removed by the powerful action of a severe storm, but the sewers being daily filled to their maximum working capacity at the hour of maximum flow, the main lines are daily swept clear of solids, and the sewage is rapidly and completely carried to the outfall before any putrefactive change has taken place in it.

In the primary lateral sewers, the amount of sewage is usually insufficient to keep the sewers clean, and here some artificial method of flushing becomes necessary. This may be effected by automatic flush tanks connected with the public water supply. They are gradually filled by a small stream of water, say of five gallons per hour. When a tank is full the continuous flow of the entering water produces a small overflow which sets a siphon in operation, and the entire contents of the tank are discharged into the sewer with great rapidity, producing a powerful flush. Other flushing arrangements operated by hand may be used if preferred.

The removal of storm water is treated under this system as a separate and independent question. It is permitted to flow over the surface of the ground as far as it is practicable to do so. When its volume becomes so augmented as to cause trouble, it is conveyed underground by channels at a slight depth, and is led to the nearest water-course by the most direct and cheapest route. The storm water may be discharged into the water-courses at several places, according to the topography. The sewage, however, is usually conveyed to a single outfall, where it may be treated chemically, or may be used in irrigation.

The experience of English engineers has led them to consider it impracticable to exclude the rain falling upon private property from the foul water sewers, because this would require two sets of house drains in many cases; one for sewage, connecting with the sewer, the other for the surface drainage of the yard and roof, and leading to other channels. They consider that it would cause may complications, and that it would be an unwarrantable exercise of authority to require the construction of two sets of house drains. They also consider that the admission of a limited amount of rain-water to the foul water sewers is an important factor in maintaining their cleanliness,

and the prevailing practice with them, when separation is attempted, is to exclude only the rain water in the streets and public squares, and to admit the rain-water from yards and the rear roofs of houses.

The practice in this country has tended towards a more complete separation of the sewage and the rainfall. This is due in part to the extreme views of some of the advocates of the separate system, and in part, no doubt, to the difference between the climates of the two countries; heavy rainfalls being more common here than in England.

The separation of the rainfall from the sewage becomes important when the sewage must finally be pumped, and when it must be treated chemically or used in irrigation. On the other hand, the separation of the sewage from the rainfall becomes important when the rainfall passes into streams that must afterwards serve as the sources of public water supplies. These conditions, demanding separation, are frequently found associated together.

The question as to the necessity for separation, and of the proper method of removing storm water, is further complicated by the fact that the first wash of water after flowing over the streets of cities, and being contaminated with the droppings of animals and other filth, becomes a variety of sewage possessing nearly, if not quite all the constituents of ordinary sewage except the peculiar germs of disease associated with human excrement, and except certain chemical products derived from manufacturing waste. By thorough and systematic scavenging the streets may be kept in such a condition that the storm water may cause little harm if permitted to pass directly into the streams, but this ideal of sanitary work is seldom attained, and the first washings of the streets during storms are usually extremely foul.

Another phase of the surface drainage of towns presents itself in the larger Northern cities in winter, when a thaw occurs after a long period of snow. The mingled accretions of snow, ice, and filth, that have been weeks in accumulating, are then liberated in liquid form in great volumes, and require prompt removal. At such times the capacity of sewers receiving surface water is severely taxed, ordinary surface channels are so obstructed as to require constant attention, and floodings frequently occur in the lower districts; travel being greatly impeded, and property in basements and cellars being often damaged.

The great cost of sewers large enough to convey all the waters of heavy storms has already been referred to, it being prohibitory in most instances. Consequently the question as to the best method of

removing storm water is reduced to a consideration of the objections, from the sanitary or from the financial point of view, to the admission of a portion of the surface drainage to the sewers conveying sewage.

The advocates of the separate system claim, among other things, that some of the earthy matters carried into the sewers by turbid storm water, particularly building lime, act as precipitants, and cause the deposit of organic matter within the sewers, intermixed with deposits of road detritus, leaves and twigs, brought into the sewers by storm water. These deposits, when not removed by the ordinary flow of sewage or by flushings, must remain until the next heavy storm, and meanwhile become the source of noxious exhalations.

The essential difference between the two systems, as regards cleanliness and freedom from deposits, arises from the fact that in the separate system the substances to be removed are derived from domestic and manufacturing wastes, while in the combined system there are, in addition, the substances brought into the sewer by the storm water. Thus, while the scouring power of the sewage in the combined sewers is, at the best, no greater than in the separate sewers, and may in certain cases be less, the amount of deposits in them may be greater, and their nature may be such as to render them more difficult of removal. Another result derived from the use of small pipes, as in the separate system, is that a given volume of water, such as the contents of a flush tank, will produce a greater scour and will more completely wash the interior of the sewer; or, to state it differently, a less amount of water will be needed to remove a given obstruction.

Great stress is laid by the advocates of the separate system upon the more perfect ventilation of the sewers when their size is small as compared with the ordinary volume of sewage flowing through them.

It is also claimed that organic matter adheres to the upper portions of the interior of sewers of the combined system when they are conveying storm water, and remains after the storm has ceased, forming a slimy coating; that this soon becomes putrid and promotes the development of swarms of microscopic organisms. On the contrary, it is claimed that the sewers of the separate system being filled every day to their maximum working capacity, afford less opportunity for the growth of noxious germs.

A comparison between the separate and combined systems from the financial point of view cannot be made explicitly, as such a compari-

son must be based upon local circumstances to a certain extent. This much, however, may be said concerning it.

The cost of a sewer depends upon a number of elements, some of which are independent of the size contemplated; thus the cost of sheeting and bracing the trench, of pumping water from wet soils, and to a very large extent the cost of excavation, back filling, and paving will not be essentially reduced by diminishing the size of the sewer. The difference in cost occasioned by the use of a smaller sewer is, however, generally in favor of the smaller sewer.

A comparison between the cost of a system of combined sewers, and a system of sewers from which surface and subsoil waters are excluded, will generally show that the latter can be built more cheaply. It should be remembered, however, that the greater cost of the combined system is offset by the provisions for the admission and removal of storm water. If the necessities of the locality require that the surface and subsoil waters shall be removed by underground conduits, their cost should be added to the cost of the house-drainage sewers in order to make the comparison valid. Should these underground conduits be equal in extent to the system of house-drainage sewers, the cost of the entire combination will usually exceed the cost of a "combined system." In most instances the conduits for surface and subsoil water need not be coextensive with the house-drainage sewers, nor do they need to be placed at so great a depth. Consequently a great many instances exist where a separate system would remain the cheapest after the addition of the cost of the necessary channels for removing the surface and subsoil water.

Mr. Eliot C. Clarke, C. E., in an elaborate and exhaustive discussion of this question, arrived at the conclusion, *"That the saving in first cost of sewers, where all of the rain flows off over the ground, will be about three fifths, depending on the character of the soil; that the final economy will depend on circumstances; . . . that surface drainage for rain is attended by a varying amount of inconvenience and damage, which increases with the growth of a town."

The separate system has been extensively discussed both in professional and popular literature. While it is generally admitted that this system possesses great merit and is particularly valuable in the development of small towns, it is not admitted that the combined system deserves all the censure that has been heaped upon it, nor that the separate system is intrinsically the best in all cases, as has

* Mass. Board of Health, L. and C., Supplement on Public Health, 1880.

been claimed. Each system has its defects as well as merits, and the choice between them will depend upon local conditions. The two systems may be used, in some cases, in different parts of the same city, with better results than would be obtained from the exclusive use of either.

THE DISPOSAL OF SEWAGE.

HISTORICAL.

The subject of the utilization and disposal of sewage has long occupied the attention of scientists and legislators, and is continually increasing in importance in every community with the increase in the density of population. It has already become a question of great moment in this country, and it has for many years been one of the most pressing questions connected with the public health of Europe. It is intimately associated with the pollution and purifaction of rivers, with the pollution of the soil and atmosphere of towns, with the purity of supplies of potable water, with the salubrity of seaside resorts, with the maintenance and development of fish supplies, and with kindred subjects.

The small area, great density of population, and multiplicity of manufactures in England have combined to produce extensive pollutions of rivers and sources of water supply in that country. Public opinion, consequently, early demanded a solution of these difficulties, and the questions involved have been examined and reported upon at great length by various government commissions and committees. Their reports, together with others from government officials, from commissions appointed by various English towns, as well as essays published in the proceedings of professional and scientific societies, and in current scientific journals, reports of engineers, and miscellaneous writings, form an exhaustive literature upon the subject that is unequalled in any other language, and has become the standard authority, except in matters concerning which the climate of England may have produced exceptional results.

The limits of this report do not permit even an enumeration of the titles of this mass of literature, much less an analysis of their contents; it may be well, however, to mention briefly a few of the more

important British government reports, as they are frequently referred to in writings on this subject.

Passing without further mention the report of the Select Committee on Metropolitan Sewage Manure to the House of Commons in 1846, the reports of the Metropolitan Sanitary Commission in 1847–48, and of the General Board of Health in 1852 and several subsequent years, should first be noticed.

At the time that these reports were written, the disposal of sewage by other methods than by allowing it to flow into water-courses and into the sea had only been attempted in a few places and on quite a limited scale. It was generally considered that efforts for the disposal of sewage should be directed towards the development of its use as a manure, and the reports of the General Board of Health in 1852 deal largely with its use in this way; either by the method of irrigation, as has been practiced at Edinburgh and Milan for years, or by the use of fixed pipes and the hose and jet, by which the sewage was conveyed under hydraulic pressure to the places where it was to be used, and was sprinked over the ground and vegetation. This latter method of application, although giving good results in certain respects, has never been extensively adopted on account of the labor involved, and more especially for the reason that it is considered imprudent, for sanitary reasons, to permit sewage to come in contact with the leaves and stalks of vegetation.

Meanwhile other methods of disposing of sewage had been developed and applied experimentally and had promised excellent results.

In 1857, Henry Austin, C. E., Chief Superintending Inspector of the General Board of Health, made a report to the President of the Board, reviewing the aspect of the sewage question and describing the means in use for deodorizing and utilizing sewage and its manufacture into solid manure. This report described the chemical and mechanical processes then in use for separating the solid matter of sewage, the utilization of the liquid portions by irrigation and by underground pipes, and gave some agricultural results from the use of sewage manure.

The conclusions arrived at in that report may be thus briefly summarized: That the evils caused by the direct discharge of sewage imperatively called for remedy; that the practical experience obtained at Edinburgh and Milan had shown the great value of sewer water on grass lands, although applied in a state of great dilution, while valuable experiments had shown the power of soils to remove from solution and retain for vegetation the fertilizing elements; that com-

plaints of nuisance had been made concerning the irrigation method, but that the sources of nuisance and danger are preventible and should not be tolerated ; that it appeared that the solid matter should be separated from the liquid sewage at the outfall, in every case, from which a cheap portable manure should be manufactured to be used in the immediate neighborhood ; that it seemed probable that such an operation would, in most places, pay its own expenses, but that the public health rather than profit should be invariably considered ; that the liquid portion of the sewage, thus cleared of its solid matter, but still retaining its chief value as manure, might then be applied with benefit to the neighboring lands in any quantity ; that such lands, if not naturally porous, should be artificially drained, otherwise, the liquid if allowed to stagnate, might engender disease ; that the results obtained from the hose and jet system appear to justify the outlay necessary for such works, but that better results may be obtained by irrigation ; that in places where no opportunity exists for irrigation, the liquid sewage, after the separation of the solid matter, should be treated with deodorizing and precipitating agents before being discharged into rivers and streams, and "that it is an object of immense public concern that the poisonous accumulations of our towns, now fast becoming the sources of pollution of our rivers and streams, should without delay be rendered powerless for further mischief, and applied, as nature's law demands, for reproductive uses. That by this means the greatest sanitary problem will be solved, and the greatest advancement of agricultural prosperity secured."

Public opinion in England at this period was urgent that some measures should be taken to remove these sanitary evils, and in the same year, 1857, a Royal Sewage Commission, known sometimes as "The Sewage of Towns Commission," was appointed "to inquire into the best mode of distributing the sewage of towns, and applying it to beneficial and profitable uses."

The deliberations of this commission extended over a period of eight years, and embraced a variety of inspections, chemical analyses, and experiments, of a careful and exhaustive character. The results obtained may be considered as representing the actual state of the sewage question at that time. The commission made a preliminary report in 1858, a second report in 1861, and a third and final report in 1865. This latter is very brief, but is accompanied by voluminous reports of experiments, and appendices. The report is substantially as follows :—

. . . "Since the date of our last report (August, 1861) we have . . . continued at Rugby the experiments which were undertaken in 1861, on the application of sewage to lands. . ."

"Your Lordships will observe that these experiments have not been confined to the application of sewage in different quantities to land, but have extended to the consumption, by cattle, of the produce so obtained, and to the production of meat and milk, and have been accompanied by a careful record of the quantities and market value of the products, and by numerous analyses of the sewage before and after irrigation as also of the grass and of the milk."

"It appears to us that these experiments have solved many of the difficulties which have hitherto attached to the question of agricultural application of sewage, and that they leave no reasonable doubt of the practicability and advantage of so employing the sewage of towns."

"We have also continued to give our best attention to all kindred experiments and inquiries, which have been going on elsewhere."

"As the results of our labors, extending over eight years, we have confidence in submitting to your Lordships the following conclusions :—

"1. The right way to dispose of town sewage is to apply it continously to land, and it is only by such application that the pollution of rivers can be avoided."

"2. The financial results of a continuous application of sewage to land differ under different local circumstances : first, because in some places irrigation can be effected by gravity, while in other places more or less pumping must be employed ; secondly, because heavy soils (which in given localities may alone be available for the purpose) are less fit than light soils for continuous irrigation by sewage."

"3. Where local circumstances are favorable, and undue expenditure is avoided, towns may derive profit, more or less considerable, from applying their sewage in agriculture. Under opposite circumstances, there may not be a balance of profit ; but even in such cases a rate in aid, required to cover any loss, needs not be of large amount."

"Finally, on the basis of the above conclusions, we further beg leave to express to your Lordships that, in our judgment, the following two principles are established for legislative application :—

"First, that wherever rivers are polluted by a discharge of town sewage into them, the towns may reasonably be required to desist from causing that public nuisance.

"Second, that where town populations are injured or endangered in health by a retention of cesspool matter among them, the towns may reasonably be required to provide a system of sewers for its removal.

"And should the law, as it stands, be found insufficient to enable towns to take land for sewage application, it would, in our opinion, be expedient that the legislature should give them powers for that purpose."

In February, 1862, about five years after the appointment of the Royal Sewage Commission, and while its labors were still in progress, the House of Commons ordered that a select committee be appointed "to inquire into the best means of utilizing the sewage of the cities and towns of England, with a view to the reduction of local taxation, and the benefit of agriculture."

This committee, which is generally known as the Select Committee on Sewage of towns, made two reports to the House, in April and July of the same year.

Their first report was merely a statement of progress and an expression of approval of the work of the Royal Sewage Commission. Their second report consisted of a statement of general principles in very guarded language. It was followed by an elaborate analysis of the evidence taken by the committee, in which the details of the subject were more fully given. The work of this committee was to a certain extent a repetition of the work of the Royal Sewage Commission, and its existence is an indication of the importance attached to the sewage question in England at that period.

This is still further shown by the appointment, by royal authority in May, 1865, of a commission to inquire into the best means of preventing the pollution of rivers; the date of this appointment being but three months subsequent to the termination of the work of the Royal Sewage Commission.

The Rivers' Pollution Commission of 1865 made three reports, the first in 1866, and the second and third in 1867. Their commission was revoked in February, 1868, and in April, 1868, a second Rivers' Pollution Commission was appointed. This second commission made six reports, the first in 1870, and the sixth in 1874.

The subjects embraced in the reports of the two Rivers' Pollution Commissions may be best stated in the language of their commissions. They were appointed "for the purpose of inquiring how far the present use of rivers or running waters in England for the purpose of carrying off the sewage of towns and populous places, and the

refuse arising from industrial processes and manufactures, can be prevented without risk to the public health, or serious injury to such processes and manufactures, and how far such sewage and refuse can be utilized and got rid of otherwise than by discharge into rivers or running waters, or rendered harmless before reaching them; and also for the purpose of inquiring into the effect on the drainage of lands and inhabited places, of obstructions to the natural flow of rivers or streams, caused by mills, weirs, locks, or other navigation works, and into the best means of remedying any evils thence arising."

The reports of the two Rivers' Pollution Commissions embrace the basins of the rivers Thames, Lee, Aire, Calder, Mersey, and Ribble, as well as the rivers of Scotland. They also made separate reports upon the A. B. C. process of purifying sewage; upon the pollution arising from the woolen manufactures and processes connected therewith; upon the pollution arising from mining operations and metal manufactures, and upon the domestic water supply of Great Britain. These reports, with the accompanying minutes of evidence and indices, were published by Parliament in fifteen folio volumes.

The various administrative functions necessary for a proper execution of the sanitary laws of Great Britain, which at various times have been vested in the General Board of Health, in the Secretary of State, in the Privy Council, in the Poor Law Board, and in local boards of health, were transferred in 1871 to a new executive authority, called the Local Government Board, whose duties embrace some of the functions of a national board of health.

It is required, among other things, that all projects for local drainage, sewerage and disposal of sewage shall be submitted to this Board, whose approval is necessary before such projects can be legally executed, and whose sanction must be had for any special tax or loan required for their construction.

In 1875, the attention of the Local Government Board having been called to the great difficulties experienced by sanitary authorities in regard to the disposal of sewage, and their advice having been repeatedly asked concerning such matters, the President of the Board deemed it expedient to appoint a committee of the Board, to make a special inquiry into the practical efficiency of the chief systems of sewage disposal then in operation, and for which loans had been sanctioned by the Board. This committee reported in 1876. Their report,* which was presented to Parliament by command, may be

*Sewage Disposal. Report of a Committee [etc.], 1876.

considered as the official statement of British experience in the disposal of sewage up to that date. The conclusions of this committee, so far as they relate to the disposal of water-carried sewage, are as follows:

"1. That the scavenging, sewering, and cleansing of towns are necessary for comfort and health . . . ."

"2. That the retention . . . of refuse and excreta . . . in cesspools . . . or other places in the midst of towns must be utterly condemned; and that none of the (so-called) dry-earth or pail systems or improved privies can be approved other than as palliatives for cess-pit middens. . . ."

"3. That the sewering of towns and the draining of houses must be considered a prime necessity. . . ."

"4. That most rivers and streams are polluted by a discharge into them of crude sewage, which practice is highly objectionable."

"5. That, as far as we have been able to ascertain, none of the existing modes of treating the town sewage by deposition and by chemicals in tanks appear to effect much change beyond the separation of the solids, and the clarification of the liquid. That the treatment of sewage in this manner, however, effects a considerable improvement, and, when carried to its greatest perfection, may, in some cases be accepted."

"6. That, so far as our examinations extend, none of the manufactured manures made by manipulating town's refuse, with or without chemicals, pay the contingent costs of such modes of treatment; neither has any mode of dealing separately with excreta, so as to defray the cost of collection and preparation by a sale of the manure, been brought under our notice."

"7. That town sewage can best and most cheaply be disposed of and purified by the process of land irrigation for agricultural purposes, where local conditions are favorable to its application, but that the chemical value of sewage is greatly reduced to the farmer by the fact that it must be disposed of day by day throughout the entire year, and that its volume is generally greatest when it is of the least service to the land."

"8. That land irrigation is not practicable in all cases; and, therefore, other modes of dealing with sewage must be allowed."

"That towns, situate on the seacoast, or on tidal estuaries, may be allowed to turn sewage into the sea or estuary, below the line of low-

water, provided no nuisance is caused; and, that such mode of getting rid of sewage may be allowed and justified on the score of economy."

Although the method of disposal by application to land was preferred in the government reports, the advocates of chemical methods were not idle during this period. Public opinion having been thoroughly awakened to the necessity of ameliorating the existing state of affairs, it was not difficult to persuade many that a valuable source of revenue could be found in the sewage that was so freely discharged into the streams, by extracting from it its fertilizing constituents, and making from them a merchantable manure, and that vast fortunes awaited those who should successfully solve this problem.

Numerous schemes were consequently proposed for the utilization of town sewage, various stock companies were formed and capital was largely invested. This action was further stimulated by the fact that many inland towns, whose sewage was being discharged into rivers, were obliged to devise means for its disposal, either from the compulsion of the authorities, or from their own perception of the necessity for so doing.

With an urgent demand on one side and credulous capitalists on the other, projects for utilizing sewage were brought forward almost without number. The most extravagant claims were made of the capability of these projects to effect wonders in making sewage a source of wealth. After a short time they were abandoned, one by one, as unremunerative, and the public became convinced that no process for the chemical treatment of sewage could be made to pay; that irrigation with sewage may prove a financial success only when all the conditions are favorable to such a result; and that the disposal and utilization of sewage should be undertaken for the improvement of the public health and not from a view to pecuniary profit.

The necessity for resorting to chemical methods has not been as great on the Continent as in England, as land could be more easily obtained, and the irrigation method of disposal has been adopted in nearly every instance on the Continent.

In this country very little progress has been made towards abating the sewage nuisance. With scarcely an exception, the prevailing practice has been to allow the crude sewage to flow into the nearest river or large body of water. The deplorable results produced in many places by this method of disposal are too well known to require comment. In a very few instances some attempt has been made to utilize sewage by irrigation, the most notable being Pullman, Ill.

THE DISPOSAL OF SEWAGE BY IRRIGATION.

The method by which earth acts as a purifier of foul liquids was first examined scientifically by Dr. Frankland, of England. The results of his examinations are given by the Rivers' Pollution Commission in their first report, published in 1870. The subject was also very carefully examined by the French engineers in charge of the sewage works of Paris.

The general theory of the purifying action of the soil may be stated as follows, abridged from a report by MM. Schloesing and A. Durand-Claye.*

When an impure liquid, such as sewage, flows upon a permeable soil, the larger insoluble particles are arrested by the surface, as by a filter. Such particles as are sufficiently minute to pass into the earth are caught before they have proceeded far downwards. This is the first action, that of a mechanical filter.

The water, freed of its insoluble matters, decends still lower, and is absorbed by the soil; each particle of earth being surrounded with an extremely thin coating of the liquid. Thus subdivided, the water presents an enormous surface to the air contained within the soil. The second action of the soil now comes into operation. An action similar to slow combustion takes place in the interior of the soil. By this action, not only are all organic impurities reduced to carbonic acid, water, and nitrogen, as in active combustion, but the organic nitrogen itself, which is much more difficult to oxidize than either carbon or hydrogen, is changed into inorganic compounds. The insoluble matters, retained at the surface, are also affected by slow combustion, especially when they have been incorporated into the soil. They are reduced to a extremely fine dust, and mingle with the mineral elements of the earth.

Experiments made by MM. Schloesing and Müntz, of Paris, have thrown considerable light upon this remarkable property of the soil in purifying sewage.

The moist materials, usually found to a greater or less degree in all soils, do not seem to be indispensable to this process. Sand that has been heated to redness, and consequently deprived of all traces of organic matters, was found to effect the complete purification of sewage and the complete nitrification of its organic nitrogen, after the

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* Schloesing et A. Durand-Claye, Rapport au Congrès International d'Hygiène de Paris, 1878.

experiments had been conducted a sufficient length of time; one condition being that the amount of sewage poured upon the sand daily should be such as to require at least eight days to pass through the sand used in the experiment, which should possess a thickness of some six or eight feet. The process of nitrification, however, is completely arrested when the vapor of chloroform is introduced into the sand. Moreover, M. Müntz has proved that this anæsthetic has the effect of paralyzing organisms which act as ferments. It therefore becomes extremely probable that this nitrification may be dependent upon the life of organisms capable of carrying the oxygen of the air to the most diverse organic matters; the *mycoderma aceti* and others, whose functions have been so well described by M. Pasteur, possess this power.

Sewage contains sufficient organic and mineral matters to nourish such organisms without the aid of the moist materials of the soil; therefore sand, as well as vegetable earth, can be used for purifying sewage. Purification by sand does not occur when sewage is first applied. The germs of the nitrifying organisms being absent, it is first necessary that they should be introduced and developed in sufficient quantity in the sand. Ordinarily purification does not begin until several weeks have elapsed. In vegetable earth it commences at once, as the organisms are already in the soil. With this exception, sand properly accessible to the air is as good as the richest earth, so far as purification is concerned.

This theory evidently does not exclude the possibility of nitrification by slow combustion, produced by oxygen solely through the action of physical and chemical forces, and without the intermediate agent of life. But the labors of M. Pasteur show that certain organisms produce nitrification far more energetically than do the chemical forces.

Soils containing various proportions of loam are suitable for the purification of sewage, while at the same time they utilize its elements. But the poorest soils, even pure sand, effect after a very short time quite as perfect a purification ; the sewage itself supplying the organisms which produce nitrification. These are already present in loamy soils.

The action of plants is often spoken of as assisting the soil in the purification of sewage. In this there is doubtless a confusion of ideas. The bare soil, without vegetation, possesses great purifying powers. This is shown by the continued purification of sewage during winter, or in summer between two consecutive crops.

The conditions necessary for perfect purification are these. There must be a flow of sewage and a flow of air. The movement of the sewage takes place successively, in three different ways; its distribution over the surface of the ground, its passage through the soil, and its discharge after being purified. The movement of the air consists in exchanges between the earth and the atmosphere, resulting in the constant renewal of the oxygen in the soil as it is exhausted by the combustion of the impurities in the sewage. The purifying power of the soil is evidently dependent upon these various motions. The aeration and the circulation of the sewage act in bringing together the oxygen and the combustible matter in the desired proportions.

The purifying power of any soil, or, in other words, the amount of impurities which it can destroy in a given time, is peculiar to itself. Whatever it is found to be, so it must be used. The aeration cannot be completely controlled, but much can be done to promote it. It is increased by loosening the soil, and by drainage. It can be destroyed by an excess of irrigation. When the soil has received the mechanical preparations needed to aid the circulation of the air, nothing more can be done to promote aeration, except by regulating the amount of sewage applied. The movements of the sewage, therefore, should always be under complete control.

Purification is a species of continuous slow combustion; the circulation of the air is a mechanical fact, also continuous. Perfection in the movements of the sewage would therefore consist in rendering them continuous in their turn. But this is impracticable. The application of sewage to the soil is necessarily intermittent, and its passage through the soil and subsequent discharge consequently become so. This intermittence, suitably regulated, does not destroy the continuity of the main action, but it is evident that the application of the sewage should be restricted within proper limits, as regards time and quantity, otherwise the purification would be rendered incomplete.

When water is applied to the surface of a porous soil, it penetrates it by displacing an equal volume of the water already in the soil, which passes away at the bottom by natural or artificial drainage. Sewage spread upon the land in intermittent irrigation acts in the same way. The liquid of one application displaces that of the preceding, and the interior of the purifying soil may be conceived as divided up into horizontal layers, each of which is occupied by the liquid of a single application. It is during the passage of the sewage through the soil in this manner that its purification takes place.

This purification is slow and continuous and requires a certain amount of time. The passage of the sewage through the soil likewise requires a certain amount of time, and if this latter is less than that required to purify it, the sewage will pass away without being perfectly purified. On the contrary, if the duration of its passage is equal to, or if it exceeds, the time required for purification, this latter will be complete and the impurities will be completely removed. Thus it is clearly seen that the amount and frequency of the irrigations must be so regulated that the sewage may remain in the soil long enough for perfect purification to take place.

It is impossible to make a general rule which shall govern the amount and frequency of irrigations. There is too much uncertainty in the data upon which such a rule would depend; such as the purifying capacity of the soil under consideration, its depth, and the quantity of water which it will retain by capillarity. In each particular case a simple calculation, based upon experiments upon the soil in question, will be necessary.

The gradual displacement of the liquids in the soil is interfered with when too much is applied at once. If the waterings are made by large quantities applied at long intervals, a portion of the sewage will descend at once to the bottom, and will escape without being purified. The more frequent the waterings, and, consequently, the smaller the amount applied at each, the more regular will be the descent of the water through the soil by displacement, and the more perfect will be the purification. Daily waterings sometimes interfere with cultivation, and consequently may be impracticable; but care should always be taken not to apply too much at once, and thereby compromise the purification. Whenever, in the interests of cultivation, the waterings are suspended or diminished, no attempt should be made to make up for lost time by giving the soil more than it is able to purify.

In the case of compact soils resting on an impervious substratum, under-draining is necessary. Without it the water would accumulate in the interstices of the ground, driving out the air, preventing aeration, the combustion of organic matters, and, consequently, purification. Putrefaction would then take possession of the soil. Underdrainage is sometimes needed in the case of porous soils resting upon an impervious substratum, when the surface of the latter has not sufficient inclination to allow the water to flow off with sufficient rapidity.

The Rivers' Pollution Commissioners write as follows concerning the purifying power of different soils —*

"The cleansing power of a soil seems to be more closely connected with physical conditions, as regards porosity and fineness of division, than with its chemical composition. Thus, the Beddington and Barking soils, whilst similar in chemical composition, are most widely dissimilar in their action upon sewage. Again, sand and Hambrook soil act very similarly upon sewage, whilst they differ considerably in chemical composition, and, lastly, the Hambrook and Dursley soils do not differ very widely in their chemical composition ; nevertheless the latter has more than twice the purifying power of the former.

"These experiments upon the filtration of sewage through various materials leave no doubt that this liquid can be effectually purified by such processes, and that probably any variety of porous and finely divided soil may be employed for this purpose. Our experiments also appear to show that if the soil be not overdosed with sewage, it will retain its efficiency for a long, if not for an unlimited, period of time, and its pores will not become clogged up."

The subject of sewage irrigation has been here treated solely from the standpoint of *purification*, and it has been shown that this can be effected by applying the sewage to porous soils, and that in its passage through such soils, if properly regulated, all its impurities are destroyed. But these impurities constitute the fertilizing principles of sewage, which are lost through the oxidizing action of the soil. It is therefore necessary to consider the subject from the standpoint of *utilization*.

†The distinction between purification and utilization is fundamental, and cannot be too strongly insisted upon. As will be shown, it is impracticable to extract all the fertilizing constituents from sewage. Therefore, in applying them to agricultural uses it becomes necessary to apply the water also. That is, we must irrigate. To purify the sewage we may also irrigate. It therefore seems that the two questions, purification and utilization, are solved by the same process. Their solutions differ, however, in an essential point, inasmuch as utilization, to be complete, requires a much greater area.

For example : it has been estimated that the sewage of Paris is each year equal to 1,200,000 tons of farm manure ; and that if

* First Report, Mersey and Ribble Basins, 1870.

† Schloesing et A. Durand-Claye, *loc. cit.*

applied to 40,000 hektares (100,000 acres) of land it would form a much richer dressing than is generally used by the French farmers. When all fæcal matters are allowed to enter the Paris sewers, it is estimated that at least 60,000 hektares (150,000 acres) may be fertilized by it. On the other hand, the area necessary to purify the sewage of Paris, which amounts to 100,000,000 cubic meters (tons) annually, will amount to 2,000 hektares (5,000 acres) if 50,000 cubic meters (tons) are annually purified per hektare (2.5 acres), or to 3,000 or 4,000 hektares (7,500 to 10,000 acres) if the quantity purified is reduced to 33,000 or 25,000 cubic meters (tons) per annum. Thus the enormous difference between the areas required for the two processes is at once apparent.

The two processes differ also in other respects. Purification on a restricted area is governed by certain laws of distribution and drainage, with which it is quite difficult to comply. Utilization over large surfaces is almost entirely independent of such rules. Consequently, with the latter the time and the amount of an irrigation may be chosen at will. The cultivation of cereals and the rotation of crops become possible. When sewage is thoroughly utilized, the cultivation is the controlling element. Purification accompanies it in one way or another, without being attended to. When sewage is merely purified, that is nearly the sole result; cultivation being a secondary consideration.

In making these comparisons, however, allowance should be made for the different amounts of fertilizing elements which different kinds of crops are able to appropriate. Thus, in market gardening, the difference between the quantity which can be purified and that which can be utilized upon a given area is much less than when the calculation is based upon ordinary farming.

Some very interesting experiments were made at Paris upon the action of growing plants upon sewage during irrigation. Four masonry-lined tanks, 10 metres (33 feet) long and 8.50 metres (28 feet) broad, which had been constructed for experiments in the chemical purification of sewage, and which were completely water-tight, were prepared by laying tile drains upon their bottoms. They were then filled to a depth of 1.80 to 2 metres (5.8 to 6.6 feet) with the ordinary soil of the Paris irrigation fields.

The amount of sewage supplied to these basins was carefully measured, as well as the quantity of water escaping from the drains, which had all filtered through the earth down to their level. Various plants, such as maize, beets, cereals, etc., were grown upon the surface of

the basins, and the crops were weighed, when gathered, with the greatest care. An exact record was thus obtained of the amount of water supplied, the amount reaching the under-drains, and the amount absorbed and evaporated by the plants.

This highly interesting result was obtained : Out of 24,000 cubic meters (tons) supplied per hektare (2.5 acres) in six months, only 1,600 cubic meters (tons) reached a depth of 1.80 meters (5.9 feet) ; and, in a general way, M. Marié-Davy concluded from his experiments that out of a supply of 5,000 to 6,000 cubic meters (tons) per hektare (2.5 acres) per month, only 1-30th of the water supplied reached the subterranean drains. Vegetation consequently acts as a powerful upward drainage. The soil transforms the impure water supplied to it, oxidizes it, and makes of it an excellent liquid manure. The plants absorb the useful elements of this manure and yield to the atmosphere, by evaporation, nearly the whole of the liquid which has served to convey them. Thus purification and agricultural utilization perfect each other.

The effluent water from the basins, escaping by the subsoil drains, was found to be nearly chemically pure, only six grammes (93 grains) of organic nitrogen remaining out of 2,262 grammes introduced, and eleven grammes (170 grains) of ammoniacal nitrogen out of 10,597 grammes introduced.*

The following is the result of an analysis of the effluent water from the Paris irrigation fields at Gennevilliers :—

(*Parts per 100,000.*)

Sulphuric acid	24.9	Soda	6.6
Chlorine	6.5	Potash	1.0
Silica	1.2	Nitric acid	8.9
Peroxide of iron	0.2	Ammonia	Doubtful traces.
Lime	32.7	Loss by calcination	9.0
Magnesia	3.1	Carbonic acid, unmeasured matters and loss	17.9

Microscopical analyses of effluent waters are somewhat rare. The effluent water from the Paris irrigation fields, however, has been submitted to careful microscopic analysis. A comparison of the results obtained by microscopic analyses of various waters is given in the following table.†

* Durand-Claye.

† Marié-Davy, Journal d'Hygiène, No. 202.

NUMBER OF MICROBES CONTAINED IN A CUBIC CENTIMETER OF DIFFERENT WATERS.

	Average of 1879.	July 6, 1880.
Water condensed from the air	....	....
Rain-water collected at Montsouris	35	....
Water of the Vanne supplied to Paris	62	....
Water from the Seine, above the Pont de Bercy	1,200	1,600
Water from the Seine, left bank near Asnières	....	3,200
Effluent water from the Paris irrigation fields	....	12
Paris sewage	20,000	....

From this it is seen that the action of the soil has reduced the number of microbes from 20,000 per cubic centimeter (16.23 minims) to 12 per cubic centimeter, and that the effluent derived from the Paris sewage contained fewer microbes than the water supplied to Paris for domestic uses. But M. Marié-Davy adds:

"We think that had the effluent water from the Paris irrigation fields passed through as great a distance as does that of the Vanne before it reaches Paris, these two numbers, now different, would be very nearly the same. We may at least draw this conclusion from these experiments: That as regards microbes, viewed as a whole and as susceptible of reproducing themselves in the nutritive liquors employed, the effluent water from the Paris irrigation fields is as pure as that of the Vanne; that is to say, that the purification by the soil is complete."

It has been urged, however, that as the microbes of sewage are intimately associated with excrementitious matter, there is danger that, however completely they may have been removed from the effluent water, the few remaining may cause the spread of disease, if the water containing them be used for domestic purposes. It has also been claimed that the exhalations from fields irrigated with sewage– the vapor from the sewage as well as the gaseous emanations from the soil—may cause the dissemination of microbes and malarial influences in the atmosphere, and consequently injure the health of those residing on or near the irrigation fields.

These questions have given rise to heated discussions among scientists. The following letter of Dr. Frankland to M. Mille, Inspecteur Général des Ponts et Chausées, briefly states the case in its true light: –*

*A. Durand-Claye, Observations des Ingenieurs, 1881.

"In reply to your letter of the 12th inst. (May, 1881), I will say that I have followed with the most lively interest the recent researches of your illustrious compatriot M. Pasteur, and I consider them of the highest importance as regards the public health. I agree with him on this point, that the germs of various kinds of disease are probably governed by the same laws of development as ordinary bacteria and the poison of anthrax."

"These considerations, however, have not modified my opinion as to the harmlessness of sewage irrigation ; for its harmlessness has been proved by ample experience, while the conditions favorable to, or destructive of, bacteria are as yet scarcely known ; and it is not improbable that agents which are thought to be incapable of affecting the vitality of these organisms may have the power of rapidly exercising a fatal influence upon them, while other agents considered deadly to these same organisms may leave them untouched. It has been recently proved by experiments in my laboratory, that although bacteria live and multiply in sulphuric acid, in cyanogen and other deadly poisons, they are at once destroyed by that inoffensive material, metallic iron."

"That there may be, in nature, powerful agents for the destruction of the germs of disease, cannot be doubted; otherwise the human race would, long since, have been exterminated. These agents, are, for the most part, unknown, but experience seems to show that some of them are active in the process of sewage irrigation; for it has been demonstrated many times in this country (England), that sewage, *even when infected by cholera and typhoid fever*, has never, when used in irrigation, transmitted disease, either to those living on the irrigation fields, or to those who consume the crops raised upon them; although, I admit, that at first sight one would be disposed to expect the contrary."

The practice of applying large quantities of sewage to limited areas, when purification is the sole result sought. has received the name of "Intermittent Downward Filtration," which was given it by the Rivers' Pollution Commission of 1868. This method, when carried to excess and to the exclusion of vegetation upon the area irrigated, has not given satisfactory results, owing to the difficulty of regulating the amount of sewage applied, resulting frequently in the saturation of the soil.

J. Bailey Denton, C. E., one of the strongest advocates of this process, writes:* "In speaking of 'intermittent filtration,' I do not

* Ten Years' Experience, etc.

refer to the practice of crowding sewage *continuously* on porous land in the careless manner often adopted to get rid of sewage, and which results in its collection in hollows and low places to injure growing crops, to depreciate the effluent, if there be any, and to cause a nuisance on the surface of the land, but I refer to the concentration of sewage *at regulated intervals* on as few acres of land as will absorb and cleanse it, without preventing the production of vegetation."

The methods adopted for applying sewage to the land are generally simple. As a rule, the distribution is better effected by temporary expedients than elaborate and costly arrangements.

The sewage is conducted to the highest points of the land to be irrigated, either by pumping or by gravity. This portion of the work, being of a permanent character, may be constructed of cast-iron pipes, brick-work, concrete, or other durable materials. Some of the principal lines of "carriers" or channels may also be of a permanent nature. The minor channels are usually simple trenches in the earth. Their position may then be easily changed according to the needs of cultivation; and it is considered better practice, in some methods of distribution, to transpose the position of the carriers and beds each season so as to equalize the purification of the sewage more perfectly. Sometimes, as at Dantzic, the sides of the small carriers are protected with coarse wicker-work, but usually the earth has sufficient coherence to render artificial protection unnecessary.

The system according to which the sewage is distributed is determined partly from the topographical features of the soil and partly from the character of the crops to be raised. The system called "Broad Irrigation" contemplates the spreading of the sewage in a broad sheet, constantly flowing over the surface of the land during each watering.

The carriers for this method are nearly level and approximately follow the contours of the ground. They are frequently placed in several tiers, forming what is termed the catch-water system; the second tier of carriers receiving the overflow from the land watered by the upper carriers, and, in their turn, distributing to the land below them.

The surface of the land should be prepared so that there may be no hollows where the sewage may become stagnant. On the other hand, the surface should not have such an inclination as will cause the sewage to flow off too rapidly. It should remain upon the land long enough for the purifying agencies to perfect their work.

Circumstances sometimes favor the division of the ground into

alternate elevations and depressions between two parallel lines of main carriers. Secondary carriers upon the ridges permit the sewage to overflow upon either side and to flow down the depressions to furrows at their bases, which conduct the surplus liquid to the lower main carrier, from which the process is repeated. Whenever practicable, the distance between the ridge and the furrow should be such that most of the sewage may be absorbed upon the slope, little or none reaching the midway furrow.

Mr. J. Bailey Denton writes: "Mr. Hope, who has arranged his land at Breton's (which is of a porous character) on the 'lands' system laid as flat as practicable, has declared that 'the most convenient size of land is forty or forty-five feet wide from furrow to furrow, with a slope of one in twenty from furrow to ridge.' In clayey, loamy lands it is probable that double the width may be adopted without increasing the height of the ridge, and this would make the rate of inclination one in forty instead of one in twenty. The character of the soil governs the inclinations of the slopes to be formed for receiving the sewage. If the soil is very porous, and particles naturally coarse, the inclination must be steeper than where the soil is naturally retentive and the particles fine."

"The larger the bed or slope that will absorb the sewage without waste the better, as it can be more economically served with sewage, and it should always be borne in mind that the larger the space devoted to individual crops the greater will be the profit, the farmer's labor being reduced proportionately to the increase of area. Every case, however, must be treated on its own specialties, and it is better to act on a tentative plan rather than determine with precision beforehand what the size and inclination of the slopes or beds should be."

The "Flat-bed System" of distribution is well adapted for market gardening. In this system the ground is divided by furrows into narrow beds having a width of from three to twelve feet, depending upon the porosity of the soil and the nature of the crops. Contrary to the system just described, the sewage runs in the furrows. The vegetables grow upon the top and sides of the narrow beds, and receive their supply of moisture and nutriment by the percolation of the liquids through the soil, the sewage never being applied to the leaves or stalks of the plants. The furrows are from eight to sixteen inches in depth, according to their importance. Their length should be such that the sewage may be nearly all absorbed in running from one end to the other. In a sandy gravel this will occur after a run of

from one hundred to one hundred and fifty feet. In clayey soils the absorption is slower and the sewage may sometimes be used, with advantage, upon several beds in succession.

The frequency of the waterings depends upon the nature of the crops, the weather, and the season of the year. With a warm climate, a permeable soil, and rapidly growing plants, frequent and abundant waterings are needed. At the Paris irrigation fields, where market gardening is extensively carried on, the waterings occur every three days, on an average. The soil being very permeable, the farmers thus use from 40,000 to 50,000 cubic meters (tons) of sewage per hektare (2.5 acres) per annum. In winter the waterings take the form of broad irrigation.

All solid substances are generally removed from the sewage before it is applied to the land. This is done by passing it through coarse strainers. In one arrangement, patented by Mr. Baldwin Latham, a vertical strainer, rotating about a horizontal axis, collects all solid matters in a receptacle, from which they are raised by an Archimedean screw and deposited in a wheelbarrow. This is in use at Dantzic, Croydon, Coventry, and other places. In rare instances the entire volume of sewage is strained through a coke filter, as at the "Croydon Rural" Sewage Works, where the sewage is thick and dark colored.

The distribution of the sewage is controlled by movable dams of wood or iron, which are set at any desired place in the carriers. The flow of sewage being thus stopped, the carrier soon fills to the top and overflows upon either side, in the case of broad irrigation, or supplies lateral carriers in the ridge-and-furrow and flat-bed systems.

These dams are of the simplest possible construction, frequently being mere plates of galvanized iron fitted with a handle and shaped to fit the form of the carrier. They are pressed into the earth after the manner of a spade. Brick and concrete carriers are supplied with grooves to receive these dams. Carriers that are under pressure, as at Paris, are supplied with simple plates that are screwed down upon the orifice of discharge, which is horizontal and at the top of the carrier. In these mechanical appliances, simplicity and economy of construction are essential features.

No difficulty is reported to exist in disposing of sewage by irrigation during winter, either on the Continent or in England. In Germany, where the climate is similar to our own, as at Dantzic and Breslau, the irrigations are reported to be uninterrupted in winter by

the frost. Vegetation not existing in winter, the purification of the sewage is effected solely by the action of the soil.

The temperature of sewage has been frequently observed at different seasons of the year, and it has been found to be relatively warm in winter and cool in summer.

At Dantzic the temperature of the sewage is said not to fall below forty degrees Fahrenheit at the pumping station, and forty-two degrees at the point of delivery to the irrigation fields. Its temperature in summer is said not to rise above fifty-nine degrees at the pumps, and forty-eight degrees at the outlet. Between the pumping station and the irrigation fields the sewage is conveyed in three siphons beneath the Vistula and the ditches of the fortifications, and is carried under ground in closed pipes to the irrigation fields. The effect upon the temperature of the sewage, of its deep passage beneath the river, is seen in its higher temperature in winter and lower temperature in summer at the irrigation fields. The irrigations are continued throughout the winter at Dantzig without interruption, in spite of the severity of the climate. The sewage is said to arrive at the irrigation fields at a temperature of forty-two degrees Fahrenheit, even during the greatest frosts. It melts the snow and ice, and continues to percolate into the ground, without causing trouble to the tenant of the farm.

The severity of the winters at Dantzic is such that the ground freezes from one to three feet deep. Water pipes are laid five feet under ground. The temperature of the air falls at times to eleven degrees below the zero of Fahrenheit. Snow falls as early as October and as late as April. The rivers at Dantzic are frozen from the middle of November till the last of April. It should be observed that the soil of the Dantzic irrigation fields is extremely porous.

The following table gives the mean monthly temperature at Dantzic for eighty-one years, observed, together with the mean monthly temperatures at Providence for the forty-eight years, from 1832 to 1876 plus 1881 to 1883 inclusive.

Month.	Mean Temperatures.	
	Dantzic.*	Providence.†
January	26.8	26.78
February	29.1	27.33
March	32.4	33.90
April	41.2	44.50
May	50.4	55.14
June	58.3	65.15
July	62.8	70.69
August	61.9	68.78
September	54.5	61.17
October	44.1	50.74
November	36.3	40.00
December	30.0	29.73

At Breslau, where the winter is nearly as severe as at Dantzic, no trouble is said to be experienced from frost at the irrigation fields, although the soil is not as porous as at Dantzic. The frost enters the ground from two, to four and one half feet deep at Breslau, and the temperature of the air at times falls to four degrees below the zero of Fahrenheit.

The following facts were observed as to the temperature of the sewage of Paris during the extremely cold month of December, 1879:—‡

"While the mean temperature of the air was 18.3° F., and while the water of the Seine was constantly at 32° F., the mean temperature, even during the greatest frosts, remained between 41° and 45.5° F. This peculiarity was noticed in 1868, but it had not been observed before under circumstances so decisive. It is due to the warming which the coldest water receives while flowing in subterranean channels, such as the sewers of Paris, the average duration of the flow of the sewage from the inlets to the outfall into the Seine at Clichy being about four hours."

In the intercepting sewer from the left bank of the Seine, which passes under the 'quartier de l'Etoile,' in a deep tunnel, and does not unite with the intercepting sewer from the right bank of the Seine until it arrives at Clichy, the temperature of the sewage was nearly

* "Danzig. . . Beziehung.

† From 1832 to 1876 inclusive, records of the late Prof. Alexis Caswell of Brown University; from 1881 to 1883 inclusive, records in city engineer's office.

‡ Durand-Claye, Comptes Rendus de l'Académie des Sciences.

four degrees higher (42.8° and 44.6° as compared with 39.2° and 41°) than in the intercepting sewer from the right bank."

"The same thing, but under peculiar circumstances, was noticed in another intercepting sewer which only carries about one fifth of the sewage of Paris, leaving the city at the Porte de la Chapelle, and discharging either upon the irrigation fields at Gennevilliers, or into the Seine at St. Denis. The sewage in the main line of this sewer, which serves Montmartre and La Chapelle, had a temperature of 39.2° to 43.7° F., analogous to that in the great intercepting sewer at Clichy. But at the Port de la Chapelle it receives a branch which passes through the entire industrial quarter of La Villette and La Chapelle. In this branch, the water from condensed steam and the waste liquids from manufactories produced a temperature of 55.4° to 66.2°, while below the junction the temperature of the sewage was maintained between 53.6° and 62.6°."

"In consequence of the high temperature of the sewage, it continued to be used for agricultural purposes during the severe frosts of December. Early in the month, it was thought that no one would wish to irrigate during such cold weather and while so much snow was on the ground, and orders were given to stop pumping the sewage to the irrigation fields. But some of the farmers petitioned for a continuance of the pumping, in order that their fields might be cleared of snow by the thawing caused by the sewage, thereby giving them an opportunity to gather certain crops, such as leeks, cabbages, etc."

The town of Pullman, Ill., disposes of its sewage by irrigation, upon a tract of alluvium overlying a subsoil of clay, some three miles distant from the town. No trouble is reported to have arisen in winter on account of frost. Sewage irrigation has also been practiced on a small scale at several asylums and summer resorts in this country, but no trouble from frost has been reported.

From what has been already written upon the theory of the purification of sewage by applying it to the land, it is evident that the amount of land required in any given case will depend upon its character as well as upon the amount and quality of the sewage. It is not practicable to formulate any general rule. Sir Robert Rawlinson writes :—*

"The areas which have been found in practice to answer are as under stated, namely, for broad irrigation about one statute acre to each one hundred of population of a fully water-closeted town ; where

*Suggestions (etc.), 1878.

tanks separate solids, and the fluid is clarified by chemicals, one acre of land prepared as a land filter may serve for five hundred of population; but there cannot be any hard and fast rules, as one mode and one area may be successful in one place and may be stated to fail in another; much will depend upon management."

One acre of land to each one hundred of population will allow the use of the sewage for agricultural purposes. In proportion as it is possible to confine the action of the land to purification only, its area may be reduced, according to the principles already given.

The following table gives the amount of land in use in several of the cities visited in Europe for the purposes of this report:—

NAME OF TOWN.	Population from which sewage is collected.	Dry-weather flow of sewage per day.	Area of land to which sewage is applied.	Number of population of town to one acre of sewaged land.	Imperial gallons of sewage per acre of sewaged land.	Nature of soil.
		Imperial gallons.	Acres.			
Bedford	22,000	1,000,000	155	142	6,451	Porous.
Breslau...... ...	300,000	7,707,500	741	400	10,397	"
Croydon........	65,000	4,700,000	450	144	10,444	"
Dantzic.........	100,000	3,063,700	395	250	7,749	"
Doncaster... ...	24,000	600,000	200	120	3,000	"
Leamington	26,000	800,000	375	69	2,133	"
Oxford..	41,000	1,250,000	318	128	3,931	"
Warwick...	12,000	1,000,000	130	92	7,692	Clay.
Wimbledon ..... After precipitation with lime.	20,000	560,000	61	328	9,180	Porous.
Wrexham	10,000	400,000	80	125	5,000	"

The amount of land at Breslau will soon be increased to about 2,000 acres; the soil at Dantzic is extremely porous; at Wimbledon the solids are extracted from the sewage by the action of lime, only the effluent being applied to the land. Throwing out these three cases, we obtain an average of one hundred and seventeen persons and 5,521 imperial gallons per acre of sewaged land.

A statistical table of nineteen towns in Great Britain, prepared by Prof. Henry Robinson,* gives the following averages:—

One hundred and thirty-seven people to each acre irrigated.

One hundred and ninety-five acres to each million imperial gallons of sewage (or 5128 imperial gallons per acre).

Thirty-eight imperial gallons of sewage per head of population per day.

* Sewage Disposal p. 79.

A statistical table prepared by H. U. McKie, city engineer of Carlisle, England, for that city, gives ninety-eight as the average number of inhabitants to each acre irrigated, as deduced from the statistics of fifty-three towns in Great Britain, and 3,826 imperial gallons of sewage per acre per day, as deduced from the statistics of thirty-three towns.

A portion of the land available for irrigation is usually reserved for a land filter to receive the excessive amounts of sewage sometimes delivered in times of heavy rain. The land filter should be upon that portion of the land which is best adapted to the purification of sewage. Its surface should be carefully graded, and it should be thoroughly under-drained if necessary. Such land filters are frequently planted with willows or "osiers."

The amount of crops raised upon sewage farms is very considerable. Four or five crops of grass are reported in many instances. This grass is usually used in the green state. The variety called Italian rye grass is largely grown upon sewage farms, as it absorbs a large amount of moisture. Roots and market-garden vegetables attain a large size when cultivated with sewage, and are of excellent quality. The amount of crop per acre is also very large, as may be seen from the statistics of the towns visited, which may be found in Appendix B.

The financial results of sewage farming depend greatly upon local circumstances and management. It is said that the income from sewage farms will sometimes pay for the cost of operating them. If, however, the annual expenses of interest, sinking fund, and the pumping of sewage be charged against the farm, this should not be expected.

THE DISPOSAL OF SEWAGE BY PRECIPITATION.

The various methods adopted for the clarification and purification of sewage, other than by applying it to the land, may be classed either as subsidence, mechanical filtration, or chemical precipitation.

Subsidence.

Subsidence consists in permitting the sewage to come to comparative or absolute rest in suitable tanks, where the solids and a portion of the flocculent matters are deposited by gravitation. The effluent water contains all the dissolved impurities, and usually some of the flocculent matter and solids, such as straws and other light substan-

ces. The process is merely a palliation of the sewage nuisance, by keeping the greater part of the solids of the sewage out of the streams into which the effluent flows. The effluent is highly putrescible, and besides containing some of the most valuable manurial ingredients of the sewage, which are lost, may itself cause a nuisance in the stream into which it flows. The odors about the subsidence tanks are sometimes very offensive.

Mechanical Filtration.

Mechanical filtration consists in straining the sewage through suitable materials, either alone or in connection with depositing tanks. The materials which have been used to filter sewage are very numerous. The following are a few of the combinations that have been used for this purpose: "Wicker frames filled with gravel; animal and vegetable charcoal with gravel; straw, ashes, dry earth, burnt clay, sand, and heath arranged in ten beds; beds of broken stone and fine gravel; boxes of perforated board filled with burnt earth, etc., cocoanut matting filters filled with gravel; sawdust, etc., etc."

This process effects a more perfect separation of the solids and clarification of the sewage than is obtained by simple subsidence in tanks. The effluent, however, possesses the same objectionable characteristics that have just been mentioned in connection with subsidence.

The filtration of sewage is rendered difficult by the slimy nature of that liquid; the effect of this peculiarity being to produce a film of foreign matter upon the surface of the filter, which gradually clogs it and prevents its effectual working. This necessitates a frequent renewal of the filtering materials. In the Farquhar-Oldham filter the process is accelerated by a scraper which continually removes those portions of the filtering material which have become inoperative.

The clarification of sewage by subsidence or by mechanical filtration is practiced at but few places. These processes are giving way to better methods.

Chemical Precipitation.

Chemical precipitation, as the name indicates, consists in adding to the sewage a solution of certain chemicals, whose action is to promote the deposition of the solid, and of a portion of the dissolved matters in the sewage. The chemicals also act as deodorizers, and to a certain extent as disinfectants, thereby rendering the works nearly devoid

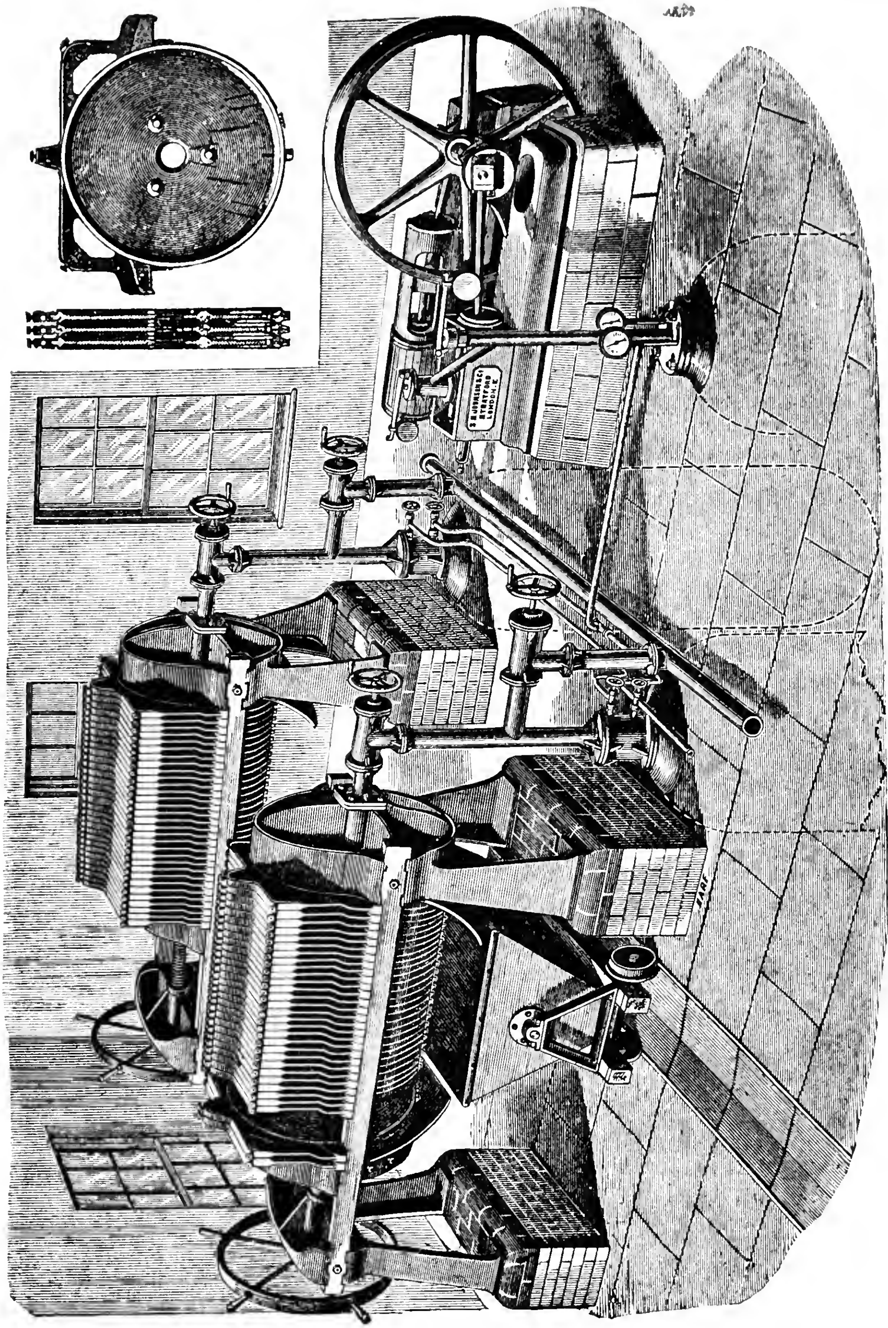
of offensive odors; thus contrasting strongly with the method of simple subsidence by gravity.

The mixture of sewage and chemicals flows into precipitation tanks, where it comes to comparative or absolute rest, and from which the effluent flows after the chemical action has taken place, leaving such impurities as have been removed. These impurities, together with the liquids retained by them, form a black fluid which is denominated "sludge." About ninety per cent. of this sludge is water, the remaining ten per cent. being the impurities obtained from the volume of sewage treated.

The disposal of the sludge is a difficulty inherent to precipitation works. In its original condition, containing a large amount of water, it is too fluid to bear transportation in the ordinary manner. It is pumped out of the precipitation tanks and allowed to flow, in some instances, upon the adjacent land, where it remains until it loses sufficient moisture by evaporation to allow it to be cut with a spade. To effect this evaporation by exposure to the air requires a great deal of time, during which the sludge gives off certain odors in warm weather which have caused complaint.

Various means have been tried to hasten the consolidation of the sludge by artificial means, as by drying upon heated floors a partial draining off of the liquids. The most successful method, however, is that recently perfected by Messrs. S. H. Johnson & Co., of Stratford, England. By this method the liquid portion of the sludge is extracted by pressure in a press of peculiar construction. The press (Plate 23) is provided with a set of "cloths" of stout canvas, which are held together by plates in such a way as to form a series of compartments, into which the sludge is forced by the pressure of compressed air, the liquids escaping through the meshes of the cloth, and the solids being retained within the compartments formed by the cloths. When all the compartments are filled with the solid substances, the press is opened, and within each compartment is found a solid cake of compressed sludge, nearly devoid of odor and of such compactness that it can be readily handled. The amount of water in the cake is about fifty per cent. of its weight. That is to say, one hundred pounds of solid matter, for example, when precipitated from the sewage, entangles within itself about nine hundred pounds of water, forming a liquid sludge. The action of the press is to extract about eight hundred pounds of the water, leaving the one hundred pounds of solids associated with about one hundred pounds of water in the cake of compressed sludge. The liquid extracted from the sludge runs back into the sewer, and passes through the precipitation tanks again.

PLATE XXIII



Johnson's Filter Press

This recent method of treating sludge has removed a great objection to chemical precipitation. The compressed sludge may be used for manure, it possessing considerable fertilizing value, depending upon the nature of the sewage and of the chemicals used, or it may be used for reclaiming land or for other purposes. The general features of precipitation works may be briefly summarized : mechanical arrangements for separating the grosser solids from the sewage; others for dissolving the chemicals and incorporating them with the sewage ; tanks of sufficient area and capacity for the precipitation of the impurities, and with channels for the escape of the effluent; pumping machinery for removing the sludge, and suitable arrangements and machinery for its disposal ; buildings for the protection of the works, for the storage of materials, and for the residence of the employés. To these may be added certain facilities for the control of the sewage, both at ordinary times and also in case of severe storms, when its volume may exceed the capacity of the precipitation tanks. At such times the sewage being greatly diluted with surface water, the excess may be sent directly to the river through overflow weirs, as has been before observed.

While these general features are common to all precipitation works, the variations in detail, and in particular as to the kind and amount of chemicals used, are very great. The following is a brief list of some of the more important chemical methods that have been tried :—*

1.—*Processes that employ Salts of Alumina as the chief precipitating agent.*

The Coventry process. Crude sulphate of alumina, salts of iron, and lime.

The Native Guano, or A. B. C. process. Alum, blood, clay, and animal charcoal.

The Phosphate sewage process, patented by Mr. David Forbes and Dr. Astley P. Price. Phosphate of alumina and lime.

Bird's process. Sulphuric acid and clay.

Stothert's process. Lime, sulphate of alumina, sulphate of zinc, and charcoal.

2.—*Processes which employ Lime as the chief precipitating agent.*

Hille's process. Lime, tar, salts of magnesium, etc.

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* Robinson and Melliss, Purification of Water-carried Sewage, 1877.

Marsden & Collins's process. Lime, carbon (a waste product of prussiate of potash manufacture), house ashes, soda, and perchloride of iron.

Holden's process. Sulphate of iron, lime, coal-dust, and clay.

Fulda's process. Lime and sulphate of soda.

Blythe's process. Superphosphate of lime, with magnesia and lime.

Whitthread's process. Dicalcic and monocalcic phosphate and milk of lime.

Capbell's process. Soluble phosphate of lime.

Hanson's process. Lime, black ash, and red hematite treated with sulphuric acid.

Goodall's process. Lime, animal carbon, ashes, and sesqui-per-sulphate of iron.

The Lime process. Milk of lime.

General Scott's process. Milk of lime; the sludge being burnt, forming Portland cement.

3.—*Processes in which Salts of Iron are used as precipitants.*

Chloride of iron and lime.

Sulphate of iron and lime.

4.—*Miscellaneous processes.*

These processes are very numerous, but have led to no practical results. In England, from 1856 to 1876, there were 417 patents issued, all more or less connected with sewage and manures.*

Of the many methods that have been tried for the chemical treatment of sewage, there are but three that stand prominent at the present time. These processes are those of—

The Rivers' Purification Association, limited,—better known as the Coventry process;

The Native Guano Company, limited,—better known as the A. B. C. process; and

The Lime process.

The Coventry Process.

The Rivers' Purification Association, limited, which was formed in 1877, "does not confine its operations to any particular system for treating sewage, but employs whatever is found to be most suitable and best adapted to the local circumstances and requirements of each place."

* Report of Local Government Board, 1876.

Although acting upon this basis, the process employed at works which the company is now operating is what is known as the Coventry process of chemical precipitation, the chemicals used being crude sulphate of alumina, proto-sulphate of iron, and lime. The company at the time of our visit in England was operating the sewage purification works at Coventry, Hertford, and Leyton, and their process has been recommended for the sewage works of the Lower Thames Valley Main Sewerage District; which if carried out will embrace the sewerage systems of fifteen or twenty towns in the immediate vicinity of London.

At Coventry the effluent from the precipitation tanks is still further purified by filtration through land before it flows into the river Sherbourne. At Hertford the effluent is filtered through coke filters. At Leyton the effluent flows directly into the stream, which is a branch of the river Lee, without any filtration whatever.

The appearance of these effluents is excellent. They are nearly, if not quite, colorless and possess little or no odor. Their chemical analyses indicate a high degree of purity. The following table gives the results of several analyses of the effluents at Coventry and Hertford, made by Prof. Wanklyn:—*

Place.	Date.	Grains per [imperial] gallon, [or parts per 70,000.]		[Milligrammes, per kilo, or] parts per million.	
		Solids.	Chlorine.	Free ammonia.	Albumenoid ammonia.
	1878.				
Coventry	June 1,	....	4.8	....	1.60
	July 22,	....	4.2	18.00	1.00
	Sept. 24,	....	4.6	14.00	2.00
	1880.				
Hertford	Jan. 7,	....	1.5	1.20	0.14
	May 28,	....	1.4	1.20	0.10

The works at Leyton have been established quite recently, and no analyses of the effluent have as yet been published.

* Reports of Rivers' Purification Association.

The sludge obtained by the Coventry process has considerable manurial value. Dr. Voelcker* estimated its theoretical value at 16*s.* 9½*d.* per ton, and its practical or market value as compared with farm-yard manure at 5*s.* 6*d.* to 8*s.* 4*d.* per ton. These values refer to sludge containing from fifty to sixty per cent of moisture. Were the moisture still further reduced by drying, the computed value would be somewhat greater. Dr. Wallace estimated its value when air dried, and containing about ten per cent of moisture, at £1 7*s.* 2*d.*† The price obtained for it, however, is very much less than these values, which have never been realized. At Coventry and Leyton the sludge, pressed into cakes containing about fifty per cent of moisture, is sold at from 2*s.* to 2*s.* 6*d.* per ton. The demand for it, however, is not large.

The A. B. C. Process.

The A. B. C. process operated by the Native Guano Company, limited, has been before the public for many years. The process is named from the initials of several of the most important ingredients used,—alum, blood, and clay. The process is now in operation at Aylesbury, Buckinghamshire, England, a town of about eight thousand inhabitants. It has also been tried in Leeds, Leicester, Leamington, London, and Paris, but its use has been discontinued in all except Aylesbury. At Leeds and Leicester the lime process has been substituted, being cheaper; the effluent produced, although not as good as that obtained by the A. B. C. process, being notably superior to the filthy river water into which it flows. At Leamington and Paris, irrigation has been finally adopted. At London, the sewage continues to be discharged into the Thames without any treatment whatever.

The Native Guano Company, being in the position of contractors, are unwilling to publish details of materials, cost, etc., which vary somewhat according to the requirements of each particular case. The original specification for the A. B. C. patent contained the following list of ingredients :‡ "Alum, blood, clay, magnesia or one of its compounds—by preference the carbonate or the sulphate, manganate of potash, or the compound of manganese, burnt clay otherwise known as ballast, chloride of sodium, animal charcoal, vegetable charcoal, and magnesian limestone. Of these substances, the manganese compound, the burnt clay, chloride of sodium, and magnesian lime-

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* Local Government Board Report, 1876.

† Glasgow Sewage Report, 1879.

‡ Rivers' Pollution Commission, Report on A. B. C. Process, 1870.

stone may be omitted, and it is not essential that both animal and vegetable charcoal should be used."

"The proportions in which the ingredients are to be used vary according to the nature of the sewage to be purified. For ordinary sewage the following proportions have answered well :—

Alum	600	parts.
Blood	1	"
Clay	1900	"
Magnesia	5	"
Manganate of potash	10	"
Burnt Clay	25	"
Chloride of sodium	10	"
Animal charcoal	15	"
Vegetable charcoal	20	"
Magnesian limestone	2	"

The proportions in use at Aylesbury are understood to be as follows :—

Twelve hundred weight of clay containing forty per cent. of moisture.

Twelve hundred weight animal charcoal containing fifty per cent. of moisture.

Five and one-half hundred weight alum (crude).

Fourteen pounds of "blood-clay," containing about seven pounds of blood and seven pounds of clay.

The animal charcoal, blood and clay are dissolved together in sufficient liquid (generally sewage), and afterwards flow in a small channel which discharges into the sewer a short distance above the precipitation tanks. The alum is dissolved in a separate vat in sufficient liquid (generally sewage), and flows by another channel which discharges into the sewer a few feet below the point of discharge of the first channel. The ingredients then flow with the sewage in a mixing channel which leads to the precipitation tanks. These are three in number. The sewage passes through them in succession by a circuitous course, most of the impurities being precipitated in the first tank. The effluent overflows from the third tank into a channel paved with white tiles to render the purity of the effluent more obvious to the eye. This channel leads to the river, into which the effluent is discharged. The effluent is not filtered in any way. At

the time of our visit it was nearly colorless, there being a faint yellow tinge and a slight tendency to froth. Its appearance was in marked contrast with the dark sewage approaching the works. The works were entirely devoid of objectionable odors.

The sludge is pumped from the precipitation tanks into an elevated reservoir, from which it passes to the sludge presses, where it is pressed into cakes. These cakes are afterwards dried (a little sulphuric acid being first added to fix the ammonia), ground into powder, packed in bags, and sold under the name of "native guano."

The following is a copy of a report of Prof. Wanklyn on the chemical composition of the effluent at Aylesbury:—*

"*Report on six samples of the effluent water from the Native Guano Company's Works at Aylesbury.*

"On Monday, Oct. 4, 1880, and on the five following days, samples of the effluent water discharged by the Native Guano Company's Works at Aylesbury were collected by Mr. Cooper and my officers, acting under the Sale of Food and Drugs Act.

"The following are the results of the analyses of the samples:—

Date of collection of the sample.	Grains per [imperial] gallon [or parts per 70,000].		[Milligrammes per kilo, or] parts per million.	
	Total solids.	Chlorine.	Free ammonia.	Albumenoid ammonia.
October 4	43.	6.1	22.00	0 76
" 5	41.	3.5	12.10	0.60
" 6	43.	2.7	5.30	0.36
" 7	34.	2.7	4.30	0.32
" 8	34.	2.5	4.10	0.20
" 9	54.	3.5	5.00	0.40

"Any of these effluents may be with safety discharged into a river.

"Regarded as effluents, all of these waters are good, the least favorable being about on par with the river Thames at London Bridge, and the best being as little impure as the unfiltered water high up the river.

"The circumstance that there were floods during the week in which the samples were taken, renders the test to which the company's operations have been subjected especially severe.

*Native Guano Company's Publications.

"In conclusion I have to record my belief, based on my analytical investigations, that the company's process as carried out in Aylesbury is most successful in purifying sewage."

(Signed) J. ALFRED WANKLYN,

Laboratory, 7 Westminster Chambers, London, S. W.

Nov. 8, 1880.

It is stated by the Native Guano Company that fish will live in the effluent produced by the A. B. C. process. They were awarded a "silver medal and a prize value of £20" at the National Fisheries Exhibition at Norwich, in 1881, "for their exhibit of process for rendering innocuous to fish-life streams polluted by sewage and chemical or other works." They were awarded "a gold medal and a diploma of honor" at the International Fisheries Exhibition, London, 1833, "for purification of sewage."

The Native Guano Company state that the price of the product or "native guano," made from the sludge, is seventy shillings per ton at the works. This value is more than double that estimated from chemical analysis. Dr. Voelcker estimated the theoretical money value of the sludge obtained from the sewage of Leeds by the A. B. C. process, when containing 15 per cent. of moisture, at 16*s.* 8½*d.*, and the value of the same as compared with farm-yard manure, at from 5*s.* 6*d.* to 8*s.* 4*d.* per ton.* Dr. Wallace estimated the value of the sludge obtained from the sewage of Aylesbury, by the A. B. C. process, in 1879, when containing about twelve per cent. of moisture, at thirty-three shillings per ton. The fact that the fertilizer made from the sewage sludge at Aylesbury sells for a higher price than is indicated by chemical analysis has, we believe, never been satisfactorily explained, the price obtained for such manures being usually less than that estimated from analysis. That it has been found to possess a high value as a fertilizer is attested by numerous testimonials.

The Lime Process.

The lime process is one of the oldest methods of purifying sewage by chemical precipitation. It is very extensively used where lime is cheap, and where a high degree of purity in the effluent is not desired. It is in use at the present time at Birmingham, Bradford, Leeds, Burnley, Leicester, and at other places.

*Local Government Board Report, 1876.

The plan of operation is usually to slake the lime, grind it, mix it with sufficient liquid (generally sewage) to form a milk of lime, which flows into the sewer and mingles with the sewage. The amount of lime used is about one ton to a million gallons of sewage. The sewage then flows into tanks, in which the precipitation takes place.

The effluent from the lime process is usually clear, but contains a large proportion of dissolved impurities in a condition favorable to subsequent putrefactive changes. When too large a quantity of lime is used, the effluent contains a surplus of free lime which is destructive to fish life. At Birmingham the effluent from the precipitation tanks is still further purified by land irrigation ; about 500 acres of land are now under irrigation, and the area will soon be increased to 1100 or 1200 acres.

The following table, from a report of Dr. Wallace to the magistrates and council of the city of Glasgow,* gives the results of analyses of the effluents at Bradford, Leeds, and Birmingham, where the lime process is used, and at Coventry and Aylesbury :—

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*Report by the Deputation appointed by the Magistrates and Council of Glasgow, 1880

COMPOSITION OF RAW AND PURIFIED SEWAGE FROM VARIOUS ENGLISH TOWNS.

Grains per [Imperial] Gallon [or parts per 70,000].

	In Solution.											Sedimentary Matter.		
	Total solids.	Saline matter.	Organic matter, etc.	Chlorine.	Equal to Chloride of sodium.	Oxygen required to oxidize organic matter.	Ammonia. Free.	Ammonia. Organic.	Ammonia. Total.	Nitrites.	Free lime.	Total.	Mineral.	Organic.
Bradford Sewage	52.64	41.16	11.48	4.13	6.80	.980	.840	.161	1.001			33.32	12.34	20.98
Bradford Sewage, after lime	124.60	110.60	14.00	4.34	7.15	1.015	.875	.168	1.043	Large.	54.58	146.90	114.80	32.10
Bradford Sewage effluent from tank	91.28	82.74	8.54	3.64	6.00	1.190	.470	.105	.575	Large.	32.06			
Bradford Sewage, filtered through coke	61.04	53.62	7.42	3.64	6.00	1.120	.420	.098	.518	Large.	14.76	4.01	4.01	
Leeds Sewage	48.58	39.34	9.24	5.53	9.12	.875	1.085	.182	1.267			24.37	9.87	14.50
Leeds Sewage, mixed with lime	42.42	35.42	7.00	6.16	10.15	.840	1.085	.168	1.253	Considerable.	2.08	36.84	25.18	11.66
Leeds Sewage, effluent from sixth tank	33.32	28.56	4.76	4.76	7.85	.682	.560	.105	.665	Large.	1.01	3.95	3.95	
Leeds Sewage, final effluent	34.86	29.26	5.60	4.69	7.73	.952	.525	.105	.630	Large.	1.01	2.46	2.46	
Birmingham Sewage	102.34	80 64	21.70	21 77	35.92	8.512	2 415	.476	2.891			31.23	16.20	14.94
Birmingham Sewage, effluent	55.72	47.18	8.54	12.18	20.09	1.386	1.470	.175	1.645	Small.	3.04	.92	.68	.24
Birmingham Sewage, effluent from land irrigation	50.26	38.50	11.76	5.74	9.47	.175	.201	.042	.243	Considerable.	10.59	Trace.		
Coventry Sewage	41.30	33.88	7.42	4.83	7.97	.423	1.820	.196	2.016	Trace.		14.81	6.48	8.33
Coventry Sewage, effluent	45.22	38.08	7.14	3.43	5.66	.294	.805	.098	.903	Considerable.		2.65	1.42	1.23
Coventry Sewage, effluent after filtration through land	44.94	38.78	6.16	3.85	6.35	.178	.647	.035	.682	Considerable.		3.58	2.90	.68
Aylesbury Sewage	49.14	40.74	8.40	4.97	8.19	.700	3.430	.147	3.577			594.98	456.73	138.25
Aylesbury Sewage, effluent from first tank	48.86	41.58	7.28	4.55	7.50	.385	1.470	.126	1.596			.98	.46	.52
Aylesbury Sewage, effluent from second tank	48.02	42.42	5.60	3.85	6.35	.245	.980	.126	1.106			.55	.31	.24
Aylesbury Sewage, final effluent	49.98	44.38	5.60	4.06	6.69	.231	1.190	.112	1.302					

The amount of sludge produced by the lime process is very much greater than that produced by the Coventry or A. B. C. processes. Its nature, moreover, is such that it is liable to putrefy and evolve offensive gases if it is exposed to the air and heat for a great length of time. Although possessing some value as a fertilizer, it is not much sought for by the farmers. At Birmingham, it was formerly sold to a limited extent at £1 for twenty-five tons of sludge, dried to the consistency of moist earth. At the present time very little is sold there. The sludge is raised from the tanks by bucket pumps, which discharge into long wooden troughs, through which it flows, partly by gravity and partly by being pushed along by men standing in the troughs. It is spread upon the ground, and when it is sufficiently dried it is dug into the ground by hand. At Bradford it is pumped and flows to a "sludge-pond," where it drains and dries. It is sold to the farmers at one shilling per ton. At Leeds, it is given away.

The sludge is disposed of at Burnley by what is known as Gen. Scott's process. By this process the sludge resulting from lime precipitation, which is composed of lime and certain organic matters, is drained, dried by heat, and afterwards burnt in kilns. The residue after burning is ground and forms a very good cement similar to Portland cement. There is usually sufficient lime mixed with the sewage. When the amount present in the sludge is not sufficient, more lime is added during the process of drying. This cement is said to stand a tensile strength of 350 pounds per square inch, after being immersed in water seven days. This refers to pure cement. The cement is sold for thirty-five shillings per ton.

Dr. Wallace * estimated the theoretical manurial value of the sludge from the lime process, by chemical analysis, at from 10*s.* 9*d.* to 21*s.* 7*d.* per ton, the amount of moisture being about twelve per cent.

Chemical precipitation, as at present conducted, fails to remove the whole of the dissolved impurities of the sewage. Nevertheless, it is sufficiently purified by chemical precipitation to meet the requirements of many cases where a high degree of purity is not needed, and a removal of the solids and suspended matters is the main object sought. This chemistry is able to do, and at the same time prevent the production of the offensive odors that accompany such a separation by gravity alone. Moreover, it is admitted that the chemical processes—some of them at least—remove a portion of the dissolved impurities. The remaining impurities can best be removed by oxida-

* Glasgow Sewage Report, 1879.

tion; either by applying the effluent to the land, where the principles that act for the purification of the sewage itself will also act upon and remove the impurities remaining in the effluent from chemical processes; or by discharging the effluent into a stream of pure water, of sufficient volume, the oxygen dissolved in the water being found to gradually remove them. "The results show that, even without contact with the air, the admixture of eight times its bulk of Clyde water is sufficient to effectually oxidize, and so render innocuous, the organic matters in *purified* Glasgow sewage. It need scarcely be added that the crude sewage mixed with Clyde water is not oxidized in the same way."*

So far as we are informed, precipitation works are an annual expense to the municipalities using them for the purification of their sewage. This result is to be expected. The annual cost of the chemicals used forms no inconsiderable item, while the income derived from the sale of sludge for agricultural purposes is uncertain and unreliable. The Native Guano Company and the Rivers' Purification Association each undertake to purify the sewage of cities for fixed annual payments. The last-named association receives, we are informed, about £3,000 per annum for purifying the sewage of Coventry, a city of 45,000 inhabitants, the amount of sewage being about 2,250,000 gallons per day.

Chemical precipitation, although inferior to irrigation in the purification of sewage and the utilization of its fertilizing properties, may be preferable under certain circumstances, viz.:—

1. When it is impracticable to obtain sufficient land for irrigation.

2. When the land available for irrigation is so far distant from the city as to render the cost of conveying the sewage to it relatively excessive.

3. When the effluent is to flow into the sea, into a tidal estuary, or into a river of large volume below all possible sources of public water supply.

Chemical precipitation and irrigation may be combined with advantage under certain circumstances, viz. :—

1. When the effluent from the precipitation process needs further purification before it is discharged into the streams, as in the case of streams of small volume, or when water is taken from the stream for public water supply below the point of discharge of the sewage effluent.

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* Dr. Wallace, Glasgow Sewage Report, 1879.

2. When the amount of land available for irrigation is limited, less land being required to purify an effluent from precipitation works than is needed to remove the entire amount of impurities from the sewage.

3. When circumstances require that irrigation shall be periodically interrupted; the sewage at such times being purified chemically, either alone or in combination with land irrigation.

COMPARISON OF THE DIFFERENT METHODS OF PURIFYING SEWAGE.

In October, 1879, Dr. R. Angus Smith made an examination of the effluents from several systems of sewage purification, and reported the results of his comparison to the Local Government Board.*

The effluents examined were from:

1. Aldershot; where irrigation alone is used. Two specimens were collected; one in wet weather, when the purification was less perfect on account of the large amount of sewage, and one in dry weather.

2. Coventry; where precipitation by alum and iron is used first, and irrigation afterwards.

3. Birmingham; where precipitation by lime is used, and the effluent is purified by irrigation. Two specimens were collected, one after lime precipitation and irrigation, and the other after lime alone.

4. Burnley; where the lime process is also used.

5. Aylesbury; where the A. B. C. process is used; the effluent passing directly to the streams from the tanks without filtration.

The report contains extensive tables giving the results of the analyses. The deductions from these tables may be briefly stated as follows:—

"*Free, including Saline Ammonia.* Its existence is of no disadvantage so far as the effect on the atmosphere is concerned, but its absorption by the soil is important as manure. Its amount indicates decomposition. So far as free ammonia is concerned, the first on the list is Aldershot (irrigation) during dry weather. Coventry (precipitation and irrigation) stands second. The next is Aylesbury (A. B. C. process). The lime processes are certainly behind."

"*Albumenoid Ammonia.* Aldershot on a dry day stands best, but not on a wet day. Coventry with its double system is next best.

* Rivers' Pollution Prevention Act, 1876. Report to the Local Government Board by Dr. R. Angus Smith, one of the Inspectors under the Act, 1882. [C.—3080]

Aylesbury with precipitation alone is almost the same as Coventry with its double purification. Perhaps this expression 'on a dry day' is not quite fair. It is meant to show that in case of an overflow there may be little or no purification, but there is generally some unless the flood be great."

"*Residual Ammonia.* Aldershot (dry) is again the best; Coventry next; Aylesbury third."

"The two chief ammonias in a sanitary point of view are the albumenoid and residual. They are therefore added."

"*Total Organic Ammonia* (*i. e., Albumenoid and Residual*) *and Total Ammonia.* The lowest effluent for total ammonia (*i. e.*, containing the least) is from the irrigation farm (at Aldershot) in dry weather. Coventry next. Aldershot (wet) and Aylesbury stand third, nearly the same." The lime effluents from Birmingham and Burnley stand last.

Nitric Acid. Nitric acid shows the effect of oxidation on the organic matter, and here the great action of air and of a porous soil shows itself remarkably. The best seems to be irrigation in dry weather, when the land has full opportunity to act."

"The use of precipitation has a decided advantage in wet weather, as it raises the purity of the Coventry water above Aldershot wet specimen. The precipitation method at Aylesbury (A. B. C. process) is the best of the single processes in wet weather. Aldershot (irrigation) is the best of the single processes in dry. Coventry, the double process, is the best in wet weather. Those which are good in wet weather would probably show still better in dry, if the specimens were taken frequently during the year. The precipitation processes, when alum or iron is used, have an advantage in wet weather, since the act of precipitation becomes an act of disinfection."

"The effluent specimens were examined as to their tendency to putrefy. Those with lime changed most. Aylesbury changed none in a week. Aldershot (dry) may be said not to have changed in twenty-five days."

"The capacity to froth when shaken is a very useful mode of finding the comparative sewage matter rapidly. It may be said to have been absent in Aldershot (dry), Coventry, and Aylesbury effluents. The clearness of the liquid is very important, although a popular indicator. In the Coventry sample were a few white floating particles. When these fell, the water was clear and colorless. Three specimens, Aldershot (dry), Coventry, and Aylesbury, were without color, when they had stood in a large colorless glass vessel."

"The question has been asked, which of these specimens is most suited for passing into a river. None of these effluents can be called sewer water in the ordinary sense. The Birmingham stream froths readily, and is not pleasant to the eye. The Burnley water was pretty clear, would do well in appearance as a stream by itself, but caused a milky deposit in the river into which it fell, arising, we may suppose, from the free lime taking up some carbonic acid from the river water and precipitating carbonate of lime. The Coventry effluent went into a stream which was very impure; and it might, so far as appearance went, pass into a shallow mountain stream without being noticed. So of Aldershot and Aylesbury."

"In every respect we may say that the best result has been obtained by irrigation, when the weather is not so wet as to cause overflowing. Still, it was not found highly successful after lime at Birmingham."

"That the precipitation with alum, or alum and iron compounds, is next."

"That in wet weather there is an advantage in precipitation, because the action is largely, if not wholly, independent of dilution."

"That the lime process is valuable, but not equal to the above precipitation processes."

"I must repeat that in this report I allude only to the merits of the effluent. There is a good deal to be examined before pronouncing on the ultimate value of the processes."

PRELIMINARY REPORT

ON

DISINFECTION AND DISINFECTANTS,

MADE BY THE

Committee on Disinfectants of the American Public Health Association.

The objection of *disinfection* is to prevent the extension of infectious diseases by destroying the specific infectious material which gives rise to them. This is accomplished by the use of *disinfectants.*

There can be no partial disinfection of such material; either its infecting power is destroyed or it is not. In the latter case there is a failure to disinfect. Nor can there be any disinfection in the absence of infectious material.

It has been proved for several kinds of infectious material that its specific infecting power is due to the presence of living micro-organisms, known in a general way as "disease germs;" and practical sanitation is now based upon the belief that the infecting agents in all kinds of infectious material are of this nature. Disinfection, therefore, consists essentially in the destruction of disease germs.

Popularly, the term disinfection is used in a much broader sense. Any chemical agent which destroys or masks bad odors, or which arrests putrefactive decomposition is spoken of as a disinfectant. And in the absence of any infectious disease it is common to speak of disinfecting a foul cesspool, or bad-smelling stable, or privy vault.

This popular use of the term has led to much misapprehension, and the agents which have been found to destroy bad odors—*deodorisers*—or to arrest putrefactive decomposition—*antiseptics*—have been confidently recommended and extensively used for the destruction of disease germs in the excreta of patients with cholera, typhoid fever, etc.

The injurious consequences which are likely to result from such misapprehension and misuse of the word disinfectant will be appreciated when it is known that:

Recent researches have demonstrated that many of the agents which have been found useful as deodorisers, or as antiseptics, are entirely without value for the destruction of disease germs.

This is true, for example, as regards the sulphate of iron or copperas, a salt which has been extensively used with the idea that it is a valuable disinfectant. As a matter of fact, sulphate of iron in a saturated solution does not destroy the vitality of disease germs or the infecting power of material containing them. This salt is, nevertheless, a very valuable antiseptic, and its low price makes it one of the most available agents for the arrest of putrefactive decomposition in privy vaults, etc.

Antiseptic agents also exercise a restraining influence upon the development of disease germs, and their use during epidemics is to be recommended, when masses of organic material in the vicinity of human habitations can not be completely destroyed, or removed, or disinfected.

While an antiseptic agent is not necessarily a disinfectant, all disinfectants are antiseptics; for putrefactive decomposition is due to the development of "germs" of the same class as that to which disease germs belong, and the agents which destroy the latter also destroy the bacteria of putrefaction, when brought in contact with them in sufficient quantity, or restrain their development when present in smaller amounts.

A large number of the proprietary "disinfectants," so called, which are in the market, are simply deodorisers or antiseptics, of greater or less value, and are untrustworthy for disinfecting purposes.

Antiseptics are to be used at all times when it is impracticable to remove filth from the vicinity of human habitations, but they are a poor substitute for cleanliness.

During the prevalence of epidemic diseases, such as yellow fever, typhoid fever and cholera, it is better to use, in privy vaults, cesspools, etc., those antiseptics which are also disinfectants—i. e., germicides; and when the contents of such receptacles are known to be infected this becomes imperative.

Still more important is the destruction at our seaport quarantine stations of infectious material which has its origin outside of the boundaries of the United States, and the destruction, within our

boundaries, of infectious material given off from the persons of those attacked with any infectious disease, whether imported or of indigenous origin.

In the sick-room we have disease germs at an advantage, for we know where to find them as well as how to kill them.

Having this knowledge, not to apply it would be criminal negligence, for our efforts to restrict the extension of infectious diseases must depend largely upon the proper use of disinfectants in the sick room.

GENERAL DIRECTIONS.

Disinfection of Excreta, etc.—The infectious character of the dejections of patients suffering from cholera and from typhoid fever is well established; and this is true of mild cases and of the earliest stages of these diseases as well as of severe and fatal cases. It is probable that epidemic dysentery, tuberculosis, and perhaps diphtheria, yellow fever, scarlet fever and typhus fever may also be transmitted by means of the alvine discharges of the sick. It is therefore of the first importance that these should be disinfected. In cholera, diphtheria, yellow fever and scarlet fever, all vomited material should also be looked upon as infectious. And in tuberculosis, and in diphtheria, scarlet fever and infectious pneumonia, the sputa of the sick should be disinfected or destroyed by fire. It seems advisable also to treat the urine of patients sick with an infectious disease with one of the disinfecting solutions below recommended.

Chloride of lime, or bleaching powder, is, perhaps, entitled to the first place for disinfecting excreta, on account of the rapidity of its action. The following standard solution is recommended:

STANDARD SOLUTION NO. 1.

Dissolve Chloride of Lime of the best quality in soft water, in the proportion of four ounces to the gallon.*

Use one pint of this solution for the disinfection of each discharge in cholera, typhoid fever, etc. Mix well and leave in vessel for at

*NOTE.—Good chloride of lime should contain at least 25 per cent. of available chlorine. (See preliminary report of committee on disinfectants; *The Medical News*, Philadelphia, February 7, 1885, page 147.) It may be purchased by the quantity at 5 cents per pound. The cost of the standard solution recommended is therefore less than two cents a gallon. A clear solution may be obtained by filtration or by decantation, but the insoluble sediment does no harm, and this is an unnecessary refinement.

least ten minutes before throwing into privy vault or water-closet. The same directions apply for the disinfection of vomited matters. Infected sputum should be discharged directly into a cup half full of the solution.

Standard Solution No. 2.

Dissolve Corrosive Sublimate and Permanganate of Potash in soft water, in the proportion of two drachms of each salt to the gallon.

This is to be used for the same purposes and in the same way as *Standard Solution No.* 1. It is equally effective, but it is necessary to leave it for a longer time in contact with the material to be disinfected—at least an hour. The only advantage which this solution has over the chloride of lime solution consists in the fact that it is odorless, while the odor of chlorine in the sick room is considered by some persons objectionable. The cost is about the same.† It must be remembered that this solution is highly poisonous. It is proper, also, to call attention to the fact that *it will injure lead pipes if passed through them in considerable quantities.*

Standard Solution No. 3.

To one part of Labarraque's Solution, (liquor sodæ chlorinatæ,) add five parts of soft water.

This solution is more expensive‡ than the solution of chloride of lime, and has no special advantages for the purposes mentioned. It may, however, be used in the same manner as recommended for *Standard Solution No.* 1.

The following powder is also recommended for the disinfection of excreta in the sick room and of privy vaults, etc.:

Disinfecting and Antiseptic Powder.

One pound of chloride of lime; one ounce of corrosive sublimate; nine pounds of plaster of Paris. Pulverize the corrosive sublimate

† Corrosive sublimate costs about 70 cents a pound, and permanganate of potash 65 cents a pound, by the single pound. This makes the cost of *Standard Solution No.* 2 a little more than two cents a gallon.

‡ We assume that the solution used will contain at least 3 per cent. of available chlorine, which would give us 0.5 per cent. in the diluted solution. The cost per gallon of the undiluted solution should not be more than fifty cents by the quantity. This would make our standard solution cost between eight and nine cents a gallon.

and mix thoroughly with the plaster of Paris. Then add the chloride of lime and mix well. Pack in pasteboard boxes or in wooden casks. Keep dry.

As an antiseptic and deodorizer this powder is to be sprinkled upon the surface of the excreta, etc.

To disinfect excreta in the sick room, cover the entire surface with a thin layer of the powder—one-fourth inch in thickness—and if the material is not liquid pour on sufficient water to cover it.

Disinfection of the Person.—The surface of the body of a sick person, or of his attendants, when soiled with infectious discharges, should be at once cleansed with a suitable disinfecting agent. For this purpose *Standard Solution No.* 3 may be used.

In diseases like small-pox and scarlet fever, in which the infectious agent is given off from the entire surface of the body, occasional ablutions with Labarraque's Solution, diluted with twenty parts of water, will be more suitable than the stronger solution above recommended.

In all infectious diseases the surface of the body of the dead should be thoroughly washed with one of the standard solutions above recommended, and then enveloped in a sheet saturated with the same.

Disinfection of Clothing.—Boiling for half an hour will destroy the vitality of all known disease germs, and there is no better way of disinfecting clothing or bedding which can be washed than to put it through the ordinay operations of the laundry. No delay should occur, however, between the time of removing soiled clothing from the person or bed of the sick and its immersion in boiling water, or in one of the following solutions; and no article should be permitted to leave the infected room until so treated.

STANDARD SOLUTION NO. 4.

Dissolve corrosive sublimate in water in the proportion of four ounces to the gallon, and add one drachm of permanganate of postash to each gallon to give color to the solution.*

One fluid ounce of this standard solution to the gallon of water will make a suitable solution for the disinfection of clothing. The articles to be disinfected must be thoroughly soaked with the disinfecting solution and left in it for at least two hours, after which they may be wrung out and sent to the wash.

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* Mercuric chloride (corrosive sublimate) is soluble in cold water in the proportion of one part in sixteen. Solution is greatly facilitated by heat.

N. B. *Solutions of corrosive sublimate should not be placed in metal receptacles,* for the salt is decomposed and the mercury precipitated by contact with copper, lead or tin. A wooden tub or earthen crock is a suitable receptacle for such solutions.

Clothing may also be disinfected by immersion for two hours in a solution made by diluting *Standard Solution No.* 1 with nine parts of water—one gallon in ten. This solution is preferble for general use, especially during the prevalence of epidemics, on account of the possibility of accidents from the poisonous nature of *Standard Solution No.* 4. When diluted as directed this solution may, however, be used without danger from poisoning through the medium of clothing immersed in it, or by absorption through the hands in washing. A poisonous dose could scarcely be swallowed by mistake, owing to the metallic taste of the solution, and the considerable quantity which would be required to produce a fatal effect—at least half a pint.

Clothing and bedding which cannot be washed may be disinfected by exposure to dry heat in a properly constructed disinfecting chamber for three or four hours. A temperature of 230° Fah. should be maintained during this time, and the clothing must be freely exposed —*i. e.*, not folded or arranged in piles or bundles, for the pentrating power of dry heat is very slight.

The limitations with reference to the use of dry heat as a disinfectant are stated in a "Preliminary Report of the Committee on Disinfectants," published in the *Medical News*, Philadelphia, March 14, 1885.

The temperature above mentioned will not destroy the *spores* of baccilli—e. g. of the anthrax bacillus, but is effective for the destruction of all disease germs which do not form spores; and there is good reason to believe that this list includes small-pox, cholera, yellow fever, diphtheria, erysipelas, puerperal fever, and scarlet fever (?) Moist heat is far more effective, and it is demonstrated that ten minutes exposure to steam, at a temperature of 230° Fah., will destroy all known disease germs, including the most refractory spores.

In the absence of a suitable disinfecting chamber, it will be necessary to burn infected clothing and bedding, the value of which would be destroyed by immersion in boiling water, or in one of the disinfecting solutions recommended.

Disinfection of the sick room.—In the sick room no disinfectant can take the place of free ventilation and cleanliness. It is an axiom in sanitary science that *it is impracticable to disinfect an occu-*

pied apartment; for the reason that disease germs are not destroyed by the presence in the atmosphere of any known disinfectant in respirable quantity. Bad odors may be neutralised, but this does not constitute disinfection in the senses in which the term is here used. These bad odors are, for the most part, an indication of want of cleanliness, or of proper ventilation; and it is better to turn contaminated air out of the window, or up the chimney, than to attempt to purify it by the use of volatile chemical agents, such as carbolic acid, chlorine, etc., which are all more or less offensive to the sick, and are useless so far as disinfection—properly so-called—is concerned.

When an apartment which has been occupied by a person sick with an infectious disease is vacated, it should be disinfected. But it is hardly worth while to attempt to disinfect the atmosphere of such an apartment, for this will escape through an open window and be replaced by fresh air from without, while preparations are being made to disinfect it. Moreover, experience shows that the infecting power of such an atmosphere is quickly lost by dilution, or by the destruction of floating disease germs through contact with oxygen, and that even small-pox, and scarlet fever are not transmitted to any great distance through the atmosphere; while cholera, typhoid fever, and yellow fever, are rarely, if ever, contracted by contact with the sick, or by respiring the atmosphere of the apartments occupied by them.

The object of disinfection in the sick room is, mainly, the destruction of infectious material attached to surfaces, or deposited as dust upon window-ledges, in crevices, etc. If the room has been properly cleansed and ventilated while still occupied by the sick person, and especially if it was stripped of carpets and unnecessary furniture at the outset of his attack, the difficulties of disinfection will be greatly reduced.

All surfaces should be thoroughly washed with a solution of corrosive sublimate of the strength of one part in 1000 parts of water, which may be conveniently made by adding four ounces of *Standard Solution No.* 4 to the gallon, or one pint to four gallons of water. The walls and ceiling, if plastered, should be whitewashed with a lime wash containing the same proportion of corrosive sublimate, or they may be brushed over with the aqueous solution. Especial care must be taken to wash away all dust from window-ledges and other places where it may have settled, and to thoroughly cleanse crevices and out-of-the-way places. After this application of the disinfecting solution, and an interval of twenty-four hours or longer for free ven-

tilation, the floors and wood-work should be well scrubbed with soap and hot water, and this should be followed by a second more prolonged exposure to fresh air, admitted through open doors and windows.

Many sanitary authorities consider it necessary to insist on fumigation with sulphurous acid gas—produced by combustion of sulphur—for the disinfection of the sick room. As an additional precaution this is to be recommended, especially for rooms which have been occupied by patients with small-pox, scarlet fever, diphtheria, typhus fever and yellow fever. It should precede the washing of surfaces and free ventilation above recommended. But fumigation with sulphurous acid gas alone, as commonly practiced, cannot be wholly relied upon for the disinfection of the sick room and its contents, including bedding, infected clothing, etc., as is popularly believed. And a misplaced confidence in this mode of disinfection is likely to lead to a neglect of the more important measures which have been recommended. In the absence of moisture the disinfecting power of sulphurous acid gas is very limited, and under no circumstances can it be relied upon for the destruction of spores.* But exposure to this agent in sufficient quantity, and for a considerable time, especially in the presence of moisture, is destructive of disease germs, in the absence of spores. It is essential, however, that the germs to be destroyed shall be freely exposed to the disinfecting agent, which has but slight penetrating power.

To secure any results of value it will be necessary to close the apartment to be disinfected as completely as possible by stopping all apertures through which the gas might escape, and to burn not less than three pounds of sulphur for each thousand cubic feet of air-space in the room.† To secure complete combustion of the sulphur it should be placed, in powder or in small fragments, in a shallow iron pan, which should be set upon a couple of bricks in a tub partly filled with water, to guard against fire. The sulphur should be thoroughly moistened with alcohol before igniting it.

Disinfection of privy-vaults, cess-pools, etc. When the excreta—not previously disinfected—of patients with cholera or typhoid fever, have been thrown into a privy-vault this is infected, and disinfection should be resorted to as soon as the fact is discovered, or whenever

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* See Preliminary Report of Committee on Disinfectants in *The Medical News* of March 28, 1885.

† One litre of sulphur dioxide weighs 2 9 grammes. To obtain ten litres of gas it is necessary to burn completely fifteen grammes of "flowers of sulphur" (Vallin).

there is reasonable suspicion that such is the case. It will be advisable to take the same precautions with reference to privy-vaults into which the excreta of yellow fever patients have been thrown, although we do not definitely know that this is infectious material. Disinfection may be accomplished either with corrosive sublimate or with chloride of lime. The amount used must be proportioned to the amount of material to be disinfected.

Use one pound of corrosive sublimate for every five hundred pounds—estimated—of fecal matter contained in the vault, or one pound of chloride of lime to every thirty pounds.

Standard Solution No. 4, diluted with three parts of water may be used. It should be applied—the diluted solution—in the proportion of one gallon to every four gallons—estimated—of the contents of the vault.

If chloride of lime is to be used, one gallon of *Standard Solution No.* 1 will be required for every gallon—estimated—of the material to be disinfected.

All exposed portions of the vault, and the wood-work above it, should be thoroughly washed down with the disinfecting solution.

To keep a privy-vault disinfected during the progress of an epidemic, sprinkle chloride of lime freely over the surface of its contents daily. Or, if the odor of chlorine is objectionable, apply daily four or five gallons of *Standard Solution No.* 2, which should be made up by the barrel, and kept in a convenient location, for this purpose.

Disinfection of ingesta.—It is well established that cholera and typhoid fever, are very frequently, and perhaps usually, transmitted through the medium of infected water or articles of food, and especially milk. Fortunately we have a simple means at hand for disinfecting such infected fluids. This consists in the application of heat. *The boiling temperature maintained for half an hour kills all known disease germs.* So far as the germs of cholera, yellow fever, and diphtheria are concerned, there is good reason to believe that a temperature considerably below the boiling point of water will destroy them. But in order to keep on the safe side it is best not to trust anything short of the boiling point (212° F.) when the object in view is to disinfect food or drink which is open to the suspicion of containing the germs of any infectious disease.

During the prevalence of an epidemic of cholera it is well to boil

all water for drinking purposes. After boiling, the water may be filtered, if necessary to remove sediment, and then cooled with *pure* ice if desired.

A sheet of filtering paper, such as druggists use, and a glass or tin funnel, furnishes the best means for filtering water on a small scale for drinking purposes. A fresh sheet of paper is to be used each day.

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